In This Issue—*Before Installing the Flat Rate*

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MAY 12 1922

MOTOR AGE

Vol. XLI
Number 19

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MAY 11, 1922

Thirty-five Cents a Copy
Three Dollars a Year

Its not surprising!
a dozen dealers a day
are taking on the
Jordan line.
Others with vision—
those who love a
winner will act
promptly —
Some day find
themselves too late—

Edward S. Jordan

Entered as second class matter Sept. 19, 1899, at the post office at Chicago, Ill., under Act of Mar. 3, 1879

NO-LEAK-O Piston Rings

THE ONLY GROOVE THAT CANNOT CLOG

Build Good Will

No-Leak-O Piston Rings build good will for you by delivering 100 per cent. *Satisfaction* to your customers.

And you know that a satisfied customer means more and greater profits.

No-Leak-O Piston Rings won't leak because they're sealed with oil. The patented "oilSEALing" groove—found only in No-Leak-O—packs an impassable oil film between piston and cylinder walls which gives perfect *oil control and compression in each individual ring.*

Every drop of gas has to *work*. No oil can work up into the cylinder head to form carbon and no "unburnt" gas or kerosene can seep *down* into the crank case to "kill" lubrication.

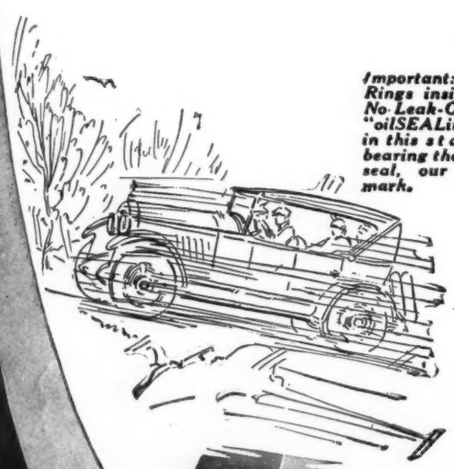
No-Leak-O Piston Rings are made in one piece—easy to install—quick seating—of finest material—guaranteed against breakage—individually tested for accuracy—and give equal tension on the cylinder walls.

Over 200 reliable jobbers carry No-Leak-O Piston Rings in all standard sizes and *over* sizes. Prompt service *always*.

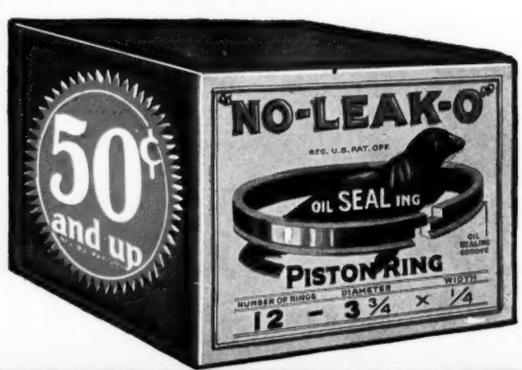
Let us tell you how you can benefit by our 1922 Saturday Evening Post advertising. Write for free booklet, "The Piston Ring Problem and Its Solution." Also send for our liberal dealer proposition. It will pay you to act quickly.

NO-LEAK-O PISTON RING COMPANY
T-25 BALTIMORE, MD.

One price during eight years of continued success.
One Design—For All Cars—50 Cents And Up.



Important: In buying Piston Rings insist on the genuine No-Leak-O with the original "oilSEALing" groove, packed in this standard package bearing the famous ring and seal, our registered trade mark.



WON'T LEAK
because they're sealed with Oil

MOTOR AGE

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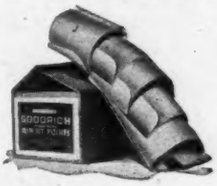
Entered as Second Class Matter Sept. 19, 1899, at the Post Office at Chicago, Ill., under Act of March 6, 1879.

There's an everyday demand for these

To-day's most widely recorded command—"Cut down expenses"—may be retarding the turnover of certain merchandise, but here's a class that is prospering because of it, GOODRICH TIRE ACCESSORIES.

Here are four items in particular that are going big—put them in the foreground of your specialty department.

Goodrich Double Wing Blowout Patches



Will hold any blowout. The wings fit under the tire beads and hold the patch snugly in place so that it cannot move or creep.

Goodrich No. 434 Vulcanizing Cement

A high-grade, heavy-bodied cement for general repair whenever vulcanization is necessary. Excellent for repair shop purposes.

Goodrich Combination Repair Sheet

For repairing with or without vulcanization punctures, cuts and small blowouts in automobile and motorcycle inner tubes—also water bottles, rubber boots, etc.

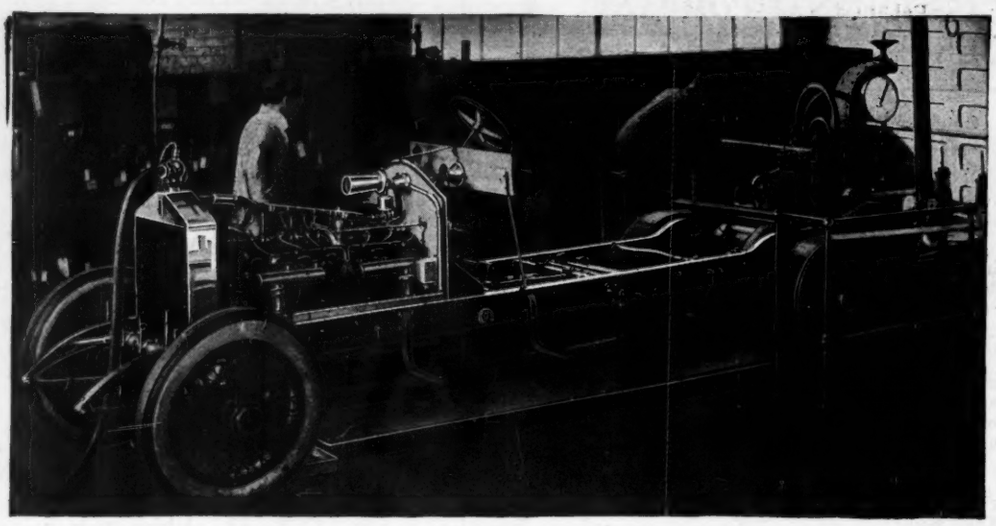
Goodrich Rubber Cement

Tubes in a carton that opens up into self-supporting stand for counter use. A big seller.

Your nearest Goodrich Branch will give immediate attention to your order.

THE B. F. GOODRICH RUBBER COMPANY
Akron, Ohio

Goodrich
ACCESSORIES



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Dynamometer chassis test reads the power of the entire car—not of the engine alone!

ENDURANCE TESTS are made at all speeds with throttle wide open, and the horse power readings taken at the end of each test—no "snap" readings are accepted.

Fuel consumption, hill climbing ability, acceleration and *pick-up from full load* are all indicated by dynamometer tests, which are later checked by extensive road tests on each individual car.

This regard for accuracy in details is insurance of that perfection and quality which is the foundation of ROLLS-ROYCE fame and prestige the world over.

Visitors are welcome, at all times.

WORKS:
SPRINGFIELD, MASSACHUSETTS

Desirable territory is open for permanent assignment to business men properly qualified and financially responsible. Information on inquiry to S. deB. KEIM, General Sales Manager, Rolls-Royce of America, Inc., Springfield, Mass.

Vol. XLI, No. 19 Chicago, May 11, 1922 $3 Per Year

MOTOR AGE

Typical "Call of the Open Road Week" exhibit of San Francisco automobile dealers during week of April 24-29. This exhibit was made by the Chase Morrill Co., distributors of Velie and Jordan cars, under the personal direction of H. B. Morrill. The radio plant indicates that motorists and campers need not lose touch with the outside world

Showing the Car in Its Recreational Setting

How the San Francisco Dealers Put Over a Big Idea by Cooperation and by Making All Dealers' Establishments Units in City Wide Show

San Francisco, May 5.

THE annual California motor car dealers' festival and pageant, heralding the opening of the spring touring season, and known as "Call of the Open Road Week," came to an end April 29, as the most successful week, both in point of attention attracted, and consequent advertising accomplished, and of actual sales.

Every dealer on automobile row, and scores of others in all parts of the city, transplanted large sections of the out-of-doors to their show-windows for the week beginning April 24, and the result was one of the finest exhibits of the outdoor attractions of northern California ever presented in San Francisco.

Dealers Arrange Clever Displays

Comment among writers, art critics and business and professional men was wide-spread as to the attractiveness and excellence of the exhibits presented. The majority of the dealers were clever enough to make the automobile in the window secondary to the camping, hunting, fishing, hiking, flower gathering, kodaking, or whatever subject they chose for the scene, so that the observer was left with the idea, "If I only had an automobile, I could enjoy that, too."

Community Dealers Co-operate

It was a clever plan and it produced results. All the dealers kept open house from about 8:30 in the morning to 11 or 12 o'clock at night, and the salesrooms were crowded throughout the six days. The city put on a special illumination on "the row," and a miniature parade of motorists going camping moved up and down this broad thoroughfare early each evening, adding to the lure which drew thousands to the dealers' places of business. It was, without doubt, the most successful advertising and sales campaign the dealers of northern California have ever attempted.

The whole show was under the auspices of the San Francisco Motor Car Dealers' Assn., and George Wahlgreen was director of the "Call of the Open Road Week."

Dealers in all manner of outing goods, from match-cases

to elephant guns, contributed to the success of the show, and helped their own sales considerably, by contributing of their wares for the stage settings in the windows of the automobile dealers. Landscape artists were employed to supply the scenes from mountain, river, lake and seashore for the windows. Some of the dealers employed quartets of singers; others had small orchestras and soloists, while still others employed motion pictures and radio concerts to entertain their visitors. It is a safe bet that never in the history of the industry have so many persons entered the dealers' salesrooms in this city as on the week just closed.

New models of a number of cars were shown and the dealers taxed their ingenuity in devising means of adapting the automobile to all manner of sports, and the results were worth the effort, for sales ran a close second to those at this year's automobile show, when they broke the record for shows of this kind.

On Wednesday, April 26, the Down Town Assn. and the San Francisco Advertising Club joined with the San Francisco Motor Car Dealers' Assn. in a luncheon at which covers were laid for 500 in the salesrooms of the Don Lee Automobile Co.'s building. Fred H. Mantor was chairman of the day and Peter Clark MacFarlane and John L. McNab were the principal speakers. Frank Carroll was in charge of the arrangements, and Harry Marquard did the catering.

Big Doings in Don Lee's Building

The big, three-ring circus of automobile row for the week was in the Don Lee building, where two floors were turned over to entertainment of visitors. The first floor contained singers, ukulele queens, jazz orchestras, and, so it is reported, some dancers, who, because of the lure of the open road, were barefoot. The second floor was devoted to camp equipment and camping, hunting and fishing scenes, with the Cadillac automobile in various sizes and styles interwoven to show its utility in all forms of outdoor life. The second floor represented a forest, with real trees, and a background of mountains, with a stream in the foreground, and virtually every dealer in sporting goods in the city was represented at some point in the display.

An Appeal to Newlyweds

H. O. Harrison presented a section from one of Uncle Sam's forest preserves, with a bride and groom motoring through it in a Hudson, and another couple in an Essex. The forest service assisted in staging this show, and the sporting goods dealers contributed the equipment used by the motorists in the forest. No detail of an up-to-date camp was omitted, and this was one of the most effective exhibits on the row.

The Howard Automobile Co. converted its salesrooms into a bower of domesticated and wild flowers, amid which all Buick models were shown, with a cut-open Buick chassis. A radiophone rendered selections frequently. The Oakland Motor Car Co. also used flowers for its decorations.

The Charles H. Kaar Co. showed the new Rickenbacker and the Lexington in elaborate camp settings, which took up all the space in the showroom.

Scene in Yosemite Valley

Butler-Veitch, Inc., transplanted a large section of the wonderful Yosemite valley to their salesroom, by having one entire wall painted to represent the valley, installing a number of large pine trees in the foreground, and running the Merced river through a bed of pine needles on the floor. Dort and Marmon cars were scattered through the pines, and a number of boys and girls in camping costumes made the scene even more realistic.

The Chester N. Weaver Co. went all the way into the mountains for its "Studebaker Camp," with tents, pretty girls, bathing suits, and everything, including a quintet of singers who sang better than many of the operatic stars for whose efforts we have paid real money. Spotlights made the aisles of tree trunks seem real forest reaches, and an Hawaiian orchestra as well as a radiophone, with the Golden Gate quintet gathered around the campfire, made the Studebaker Big Six back in the shadows all that was needed to complete the picture.

Motion Pictures and Stuffed Animals

The Chase-Morrill Co., which sells the Velie and Jordan, called in the taxidermist and filled its section of the forest with wild animals and game birds, and showed a motion picture of the Velie on the bottom of the Grand Canyon of the Colorado.

The Greer-Robbins Co. banked a forest across the back of its salesroom and showed a Hupmobile just coming 'round a bend beside a mountain lake.

J. W. Leavitt & Co. staged "Leavitt's Camp," with the Oldsmobile and Columbia playing prominent parts. This was the first showing of the Columbia Light Six here.

The Paige Co. of northern California showed a Paige beside a real mountain lake, with live fish in it, and, on the opposite side of the room, the Jewett, in a simple but gorgeous setting of royal purple and golden drapes, in which the colors of California blended so perfectly as to be mirrors in the shining metal of the car. Spotlights kept constantly playing on this car made it one of the most striking exhibits on the row.

Some More Movies

Lou H. Rose, who sells Chalmers and Maxwells, opened most of his space for seats for spectators of a motion picture, "Something New," featuring Nell Shipman and the Maxwell car. The film was shown every hour, and capacity of 200 was filled at every showing. Rose estimates that more than 10,000 persons saw the film.

Twenty-four of the leading accessory dealers and jobbers in San Francisco combined in an exhibit of their wares on the first floor of the Don Lee Co.'s building, in connection with the "Call of the Open Road Week." A full orchestra was employed, and the business of manufacturing some of the accessories was shown.

Business Stimulated

The natural cosmic urge to get close to nature, to move out and onward, seems to have received a considerable impetus from the "Call of the Open Road" celebration, for repair shops report that the are "full up" with cars being overhauled and made ready for long tours out of both San Francisco and Oakland. Accessory dealers report a very considerable increase in the sales of equipment, and the motor car dealer is happier over his sales sheet than he has been for three years or more. California shows a gain of 39 per cent in registrations for the first three months of 1922 over the same period of 1921, and April—from all present indications—will swell the percentage for the four months very materially.

While the foregoing report of the "Call of the Open Road" week covers only San Francisco activities, similar results were obtained by dealers throughout the state and are just as commendable.

Touring Supplies and the Automotive Dealer

TWENTY-FIVE per cent of the automobile dealers in San Francisco sell camping tents suitable to be carried on motor cars and used for camping by parties traveling by car. These dealers carry such tents in stock.

All dealers however assemble camping outfits for their customers, buying such outfit from automotive equipment and sporting goods dealers and others handling these lines.

Fifty per cent of the automotive equipment dealers carry in stock camping outfits, including tents and hardware but they do not handle the clothing and food. This business is growing rapidly and more and more equipment dealers are stocking these goods.

Practically all motor car dealers in San Francisco have special arrangements with equipment dealers whereby the customers of the motor car dealer ostensibly buy their equipment through the car dealer.

About 75 per cent of the camping outfits shown during the "Call of the Open Road Week" were supplied by automotive equipment dealers.

Before Installing the Flat Rate System You Must Put Your Shop in Order

System and Method Must Be the Ruling Factor If the Shop Is to Turn Out Good Work—Equipment Alone Will Not Do It—Every Movement the Mechanic Makes Must Count to Make Maintenance Pay

By B. M. IKERT

A FEW years ago when the flat rate system was first talked about there were a few persons actively engaged in or associated with the automotive industry who firmly believed that the time would come when all maintenance work would be sold on that basis.

Then there were those who scoffed at the idea. Many of them still do and probably will until they pass out as active persons in the maintenance business and will wonder why they passed out.

There were those who said the flat rate system was all right if all jobs would run the same. "How can you put a flat rate on the job of valve grinding for two cars when the valves in one car may be worse than in the other?" they would ask. Or, "How can you charge a man who takes good care of his car the same price for greasing a set of springs that you charge the man who is careless and allows the springs to become rusted together?" Such questions were common and still are among those who have not as yet grasped the real facts in the establishment of the flat rate or fixed price system.

Work Averages Nearly the Same on Cars of the Same Class

One jobber in the industry when asked if he believed in the flat rate system went so far as to ask, "How can you charge the same price for a valve grinding job on a Ford as you would on a Packard?" Clearly he did not have the first conception of the flat rate system.

The flat rate system is nothing more than a fixed price for a certain repair operation on a certain make of car and must be estimated only by local conditions under which a shop operates.

Then we have those who say the flat rate system is all right if you only handle one make of car, or at most two makes of cars. Still we have shops today, not selling or handling any make of car, that are selling their work on all makes of cars on a flat rate basis. But, when you trace the history of these shops you will find that the man in charge has been in the business for a long time and besides being an excellent mechanic knows how the work must be merchandised. He knows that fundamentally the work on one six-cylinder engine will not vary a deal from the work on another six-cylinder. He knows that fitting a set of main bearings on one four-cylinder engine will be pretty much the same as on another engine of the same number of cylinders.

A man who has been in the maintenance end of the automotive industry for several years and boasts of having worked on practically all makes of cars and yet who cannot establish a flat price for any of the common repair operations on the popular makes of cars, has been working all these years in the wrong direction.

THERE is nothing complicated about the flat rate system. The greatest amount of work is involved in getting ready to use the system. Once you have arrived at a definite price for a given operation (labor), its application is easy. But, arriving at the price; that's the job. Among the first things to do is to put your shop in order. It must be conducted along such lines as will insure getting the most work done in the least possible time. All of which simply means orderliness, cleanliness, equipment, system and methods.

The trouble may lie in the fact that while the man might be an excellent mechanic, he is not given to the keeping of records. While he might be able to devise all sorts of labor saving and time saving apparatus in his shop he does not know how to apply the saving of time and money in the institution in the broader sense of the term.

Many men get the idea that the flat rate system is applicable only to the large institution, one with a large personnel and much equipment. This is not the case, even though it is true that the system might be a little more readily applied in the large institution.

We know of one small shop which has no machine tools whatsoever in it, but which sells all its work at a fixed price. The man in charge, himself an excellent mechanic, formerly was service manager for a concern handling a popular make of car, knows thoroughly the repairing end of the business, and, what is still better, knows how to sell it to his customers.

His place, we have said, is a small one but one glance inside reveals to you the fact that system governs it. He has an arrangement with a machine shop a block or two away to do all his machine work. Consequently he has no high overhead in this respect. He is situated in a very large city and should he need parts for a car he usually can get them readily without having to resort to making them or having them made.

Complete Equipment Need of Small Town Dealer

In this respect his business differs from that of a man operating in a small town, many miles away from a large city. Such a man is practically forced to put in machine tools to be able to take care of his trade. Whereas, the man mentioned in the above paragraph is able to get a bushing on short notice in his city, the small town man may have to make up one for a customer. As this man told us, "Why should I put in a lathe when all my lathe work would not amount to more than $100 a year. A good lathe would cost me $600 and, by the time the lathe paid for itself, it would be worn out."

Located in a large city with an excellent machine shop close by, his reasoning is logical, but the small town man who serves quite a community could not afford to reason that way. He must bring the large city facilities into his own organization, so far as practicable.

But to get back to the man with the small shop in the large city. On the walls of his shop you see an assortment of tools, all neatly arranged so that any of them is readily grasped. He has them arranged this way for several reasons. When starting a job he knows what

tools are needed and, consequently, places them in such a manner that the minute he is through with one, he reaches for the next tool, and so on.

Also when he is through with a job, he merely glances at the tools on the wall to see that none are missing. If there is a vacancy he knows that this tool is either in the customer's car or misplaced in the shop. It is an excellent plan for checking up the tool equipment and has meant the saving of much money in that tools are not lost as so often happens when they are not checked up. This is an important item in any shop, large or small. The large shop usually has some sort of checking system for its tools, but for the small institution there is no reason why a system like the above cannot be used to advantage.

The Car Owner Pays for Mechanics' Mistakes

Another very important thing which this man told us is this: "Give me one or two good mechanics and we will turn out more work in a day than a whole shop-full of ordinary mechanics." He further said, "I remember when I was working at ————, we used to 'stall' around between jobs and otherwise waste a lot of valuable time. We spent as much time walking back and forth from the bench to the job as we did working on the car."

And all this time the customer paid for the work on an hourly basis.

Right here it may be well to mention a thing he told us about his earlier work in the maintenance business. He was working as a beginner in a maintenance department and was put to work on a valve grinding job. He was learning the business, you understand, but just the same he was put to work on one of the regular jobs for a customer. He recalls that in replacing the cylinder head cap screws, he turned several of them down too hard (no one had seen fit to teach him how to do the trick properly) and twisted them off.

This meant drilling out the remains of the broken screws and tapping the holes again. He did this as best he knew how, but he says that the holes were crooked and it took a lot of hammering and abuse to eventually get out the work. All the time the customer was paying $1.25 an hour for his "first class work," as it was advertised. The customer was paying for his education in repair shop work.

All these things he remembered when he opened his own maintenance business. That's the reason he says, "Give me one or two good mechanics and we will turn out more work in a day than a whole shop-full of ordinary mechanics." He says further, "We work. We know when we have charged a man $10 for a job that he has gotten his $10 worth of work. But we also have made our legitimate profit."

Now the fact that this man can build up a good reputation in a large city with only a small shop, shows that there are some principles which he must apply to the successful operation of his business and which, if equally well applied, will spell the success of any shop.

If there is any one thing we should like to point out as the uppermost thought coming out of a study of this man's place of business, it is that this man works understandingly. And that, after all, is the basis upon which the success or failure of any business rests.

The Territorial Location of the Business

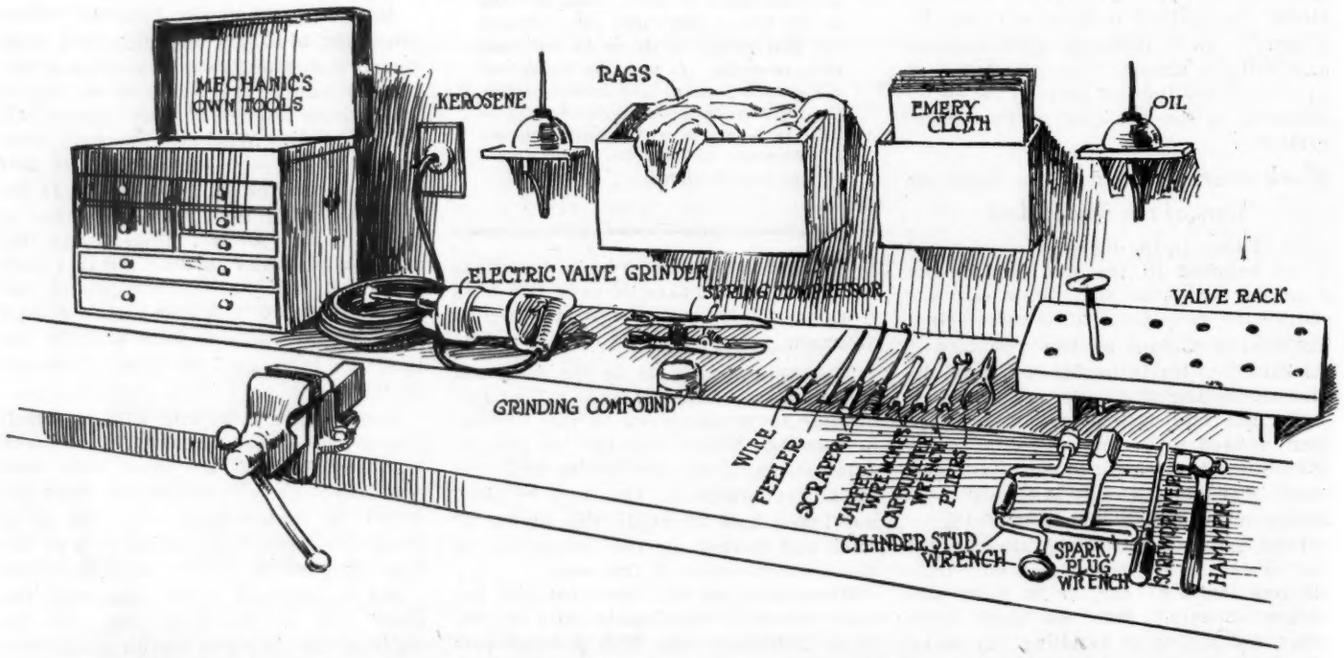
Now, it makes a big difference in any business whether it is located in Philadelphia or at Hale's Corner. The cost of labor, rents, overhead, etc., naturally are higher in a manufacturing center than they are in a farming community. Consequently the automotive dealer must base his costs upon the factors applying to his community.

That is the reason why we never can have the same flat rate price on a given repair operation for a particular make of car in two vastly different sets of conditions. Economic conditions and local conditions must govern the establishment of flat rate or fixed rate prices on automotive repair work.

A concern doing cylinder regrinding work in a small town will get less for its work on a block than the concern in Chicago or St. Louis, where the overhead is greater. Yet both concerns will make a profit.

We have pointed out repeatedly in these columns that pricing maintenance operations when a concern seeks to sell its work on the flat rate basis, must be done by the concern itself. Many dealers have asked us for flat rate prices on the repair operations for the car they handle, but it is possible only to give them prices which have been established

To Insure Doing a Repair Operation in Minimum Time Have Right Tools Handy



In order to perform any shop operation certain tools are necessary for that particular job. Is there any reason, therefore, why a man must, while working on a valve grinding job, say, go to the tool room for a certain tool, when he knows beforehand just what operations will be involved and what tools are necessary? If a mechanic has a layout of equipment like the one shown here, he is ready to tackle the job of valve grinding and will lose no time

by other dealers and at best these could be comparative only. Supposing one shop quotes a flat price on a valve grinding job on a certain make of car of $4.50. Perhaps this shop has an electric valve grinder and can turn out the job in much less time than the shop not so equipped. Therefore, the $4.50 would not do as a 'bogey' for every other shop in the country working on the same make of car. The shop which had to do this job by hand might have to charge $6.50.

Equipment of Shop Leading Factor

Readers will recall that in the articles which appeared in MOTOR AGE recently regarding the Hudson-Frampton and Vesper-Buick companies in St. Louis, it was pointed out that equipment played a leading role in the ability of these two concerns to sell their maintenance work so effectively and satisfactorily.

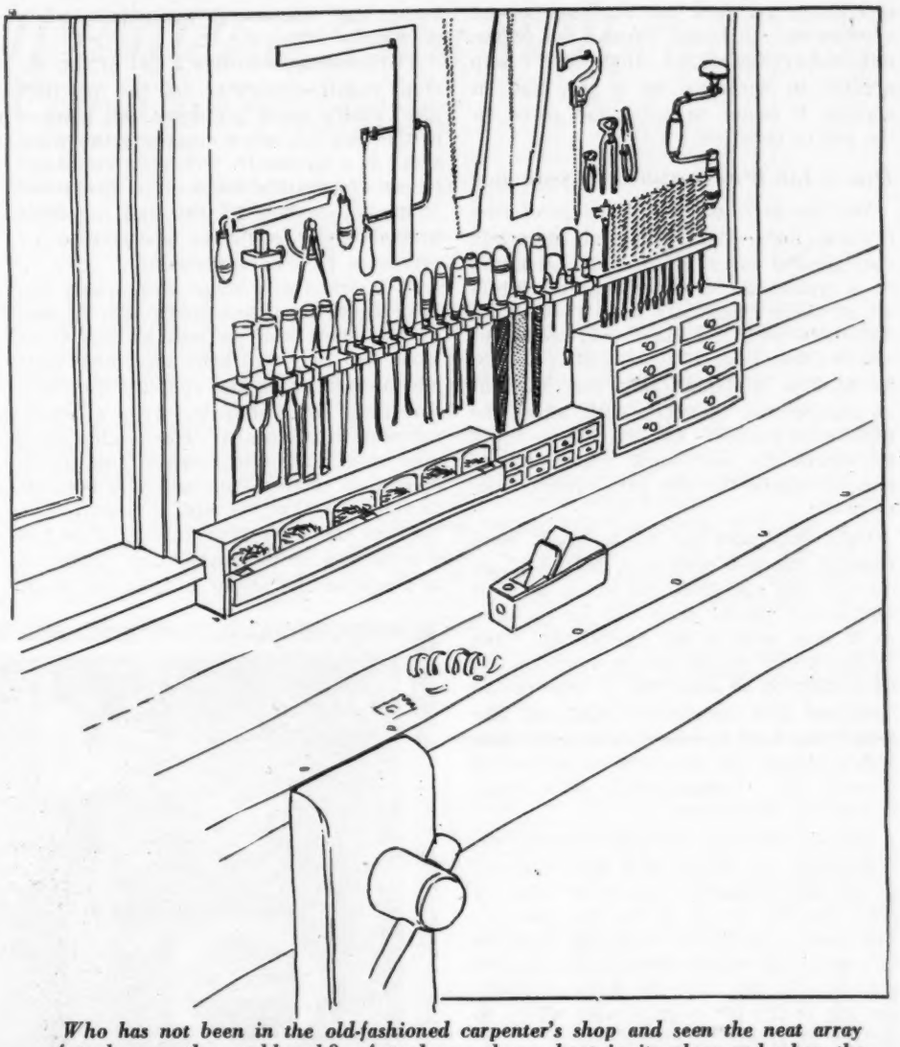
It is not the thought in this article to advocate reckless buying of equipment, but equipment does and must play a big part in the application of the fixed price system. It is common sense reasoning. Any machine or tool which cuts down the time element is a valuable asset. It will allow more of the same work to be done over a given period and, therefore, makes it possible to cut down the cost of the operation to the customer. But best of all, so far as the dealer is concerned, it makes for more profit. For example, in a recent editorial we said:

VALVE grinding happens to be one of the most frequently performed operations in the automotive repair shop. It is natural, therefore, that we find in most shops today apparatus either bought or made in the shop designed to facilitate this operation. But it is a distinct surprise to go into quite large shops and find it without a valve grinder which is electrically driven. And yet this is sometimes the case.

We do not believe that the large shop, or even the small shop, for that matter, should be without an electric grinder. In the case of the large shop, its value is easily comprehended. In the small shop it may result in the taking in of more work, because the grinder will permit of more jobs being handled in a given time and, furthermore, make it possible to establish a flat rate for the operation which is cheaper than the old hand method.

As an example, suppose one man can grind the valves in a certain six cylinder engine in four hours, doing the work by the old hand method. If the shop charges the customer at the rate of $1 an hour, it gets $4 for the job. An electric valve grinder will let it do the work about four times as fast. In other words with such equipment it can handle four jobs in the same length of time as it takes for one by the old method. A flat rate price of $2.75 may then be set for the job and the shop will take in $11 for four hours work in place of $4. Best of all it is saving the customer $1.25 on the job.

Is there a good reason why your shop should be without an electric valve grinder? We think not.



Who has not been in the old-fashioned carpenter's shop and seen the neat array of tools over the workbench? A tool was always kept in its place and when the carpenter had finished with it always restored to its proper place in the rack. Many a valuable lesson could be learned by the automative mechanic from the old-fashioned carpenter's way of handling tools.

It is not for a publication of this kind to tell the shop what tools it must have to properly do the work on a certain make of car. Many of the car manufacturers now sell to their dealers special equipment designed to facilitate service and repair operations on that car. In addition there are innumerable wrenches and other hand tools, all designed to cut down the time element in repairs and incidentally do better work.

Analysis of Potential Business Is Necessary

Then there is the great assortment of shop furniture, like engine stands, cranes, arbor presses, crankshaft straighteners, etc. all of which is valuable and if judiciously bought will prove a good investment.

Equipment must be bought on the volume of work to be handled. Unless a dealer can analyze his territory as to present business and potential business, he may buy machinery and tools unwisely. But of as great importance is the proper use of tools and machinery after they have been bought. What is gained, for instance, by having a lot of special labor and time saving wrenches for a job, if these wrenches are scattered all over the shop and a man has to spend considerable time in locating them?

The establishment of the fixed price system in the shop means for one thing that all necessary tools and material for a certain job will be on the spot at the moment the operation is started. There is no good reason why a man has to leave a job of valve grinding, once it is begun to get tools or material. Can there be any excuse for his having to go from the job to the bench or tool room because he has discovered that he is minus the cylinder head stud wrench?

Should he not have first checked over his tools to make sure that all were there for that particular operation? It goes back to the old saying that many

mechanics are paid for walking instead of working. It is the cutting out of the unnecessary walking that will help greatly in speeding up a job, and in making it easier to put a flat price on the job in question.

How a Job Was Outlined in Sequence

We recently asked a number of mechanics just what tools and materials they needed for a job of valve grinding on a typical six cylinder engine. While all of them eventually named about all the tools and materials that would be needed, they gave, if nothing else, an idea as to how systematically they thought as regards the sequence with which the tools were needed. And only as we think systematically and work systematically can we apply the flat rate system successfully.

Only one man out of a dozen went through the list with any degree of sequence. He visualized the job as he went along and named each tool in its turn as it was used in the operation. Thus he knew that on the car in question, the first thing to be done was to remove the hood and then the radiator stay rod. The latter was held in place by a cotter pin, which meant the pliers were needed to remove it. Consequently this man named the pliers first.

Then he thought of draining the water. Sometimes the drain cock gets clogged, so he next named a piece of wire to poke into the drain to free the opening. The hose connections came off next, so he named the screw driver to loosen the clamps. In that way he went on down the list to the feeler gage with which to set the valve tappet clearance.

The men who did not think or reason as systematically as this man started their lists with the valve lifter, grinding compound cylinder head stud wrench, etc. The result was that many of them had to be reminded that such and such tool also was necessary. There can be only so many tools used on a given job and it should certainly not be a difficulty for any shop to make up a list for each operation. Many of them will be duplicates, to be sure, but that can be no objection.

As a suggestion we offer this plan:

Let a selection be made for each operation and let them be numbered 1, 2, 3, etc. Thus group 1 might be for valve grinding; 2, removal of engine from frame; 3, installing new oil pump, etc.

Listing the Tools to Fit the Job

It is the custom of course, in most places for the men to furnish their own tools, so far as the common hand tools are, concerned. Therefore, these lists would include only the tools owned by the shop, such as reamers, special valve lifters, etc. A mechanic then could go to the stock room, tool room, or wherever the tools are kept and ask for equipment No. 1, 2, etc. This would always insure a mechanic having the right and necessary equipment when starting a job.

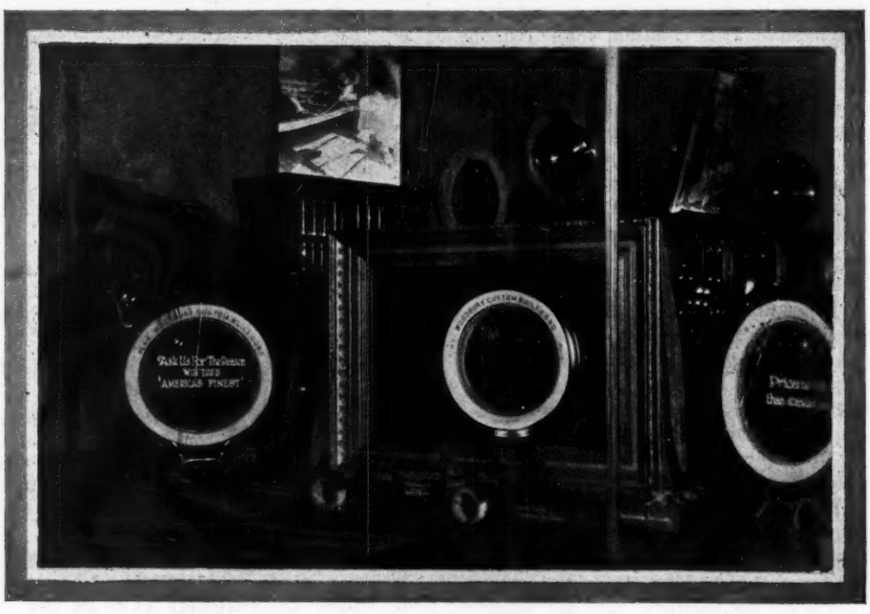
The foreman who has a list of the various repair operations and the tool lists also, easily could jot down the number of the tool list when assigning the work order to a mechanic. The plan would not be so elaborately handled in the small shop, but even here the list of tools needed easily could be ascertained by reference to a record sheet.

Of course, in a large shop which has been departmentized, there will be one or two men who do nothing but valve work and they will have their own tools and apparatus on the spot all the time. But in the small shop, the work will vary for each man, usually. Hence after each operation has been finished the bench should be clean. This makes it possible to start the next job with a clean bench. No man can work fast, or well, if he has a collection of tools and parts scattered in heaps on the bench with only a small portion of its top clean. No tool can be readily found lying in a jumble with dozens of others.

The old fashioned carpenter used to build his work bench with a tool rack at the back and when he finished with any tool he always put it back into the proper pocket or holder from which it came. In this way he knew just where to reach for it at all times.

In conclusion, if you wish to put your work on a flat rate basis, or even if you just want to make your shop more tidy and build up the morale, try arranging the tools and apparatus so they can be easily found and used to best advantage.

Before you condemn the flat rate system look around your shop and see if you have put your house in order to properly receive the flat rate system. Those institutions which are making a success of the flat rate system, we notice, are the one which long ago realized the value of having their houses in order.

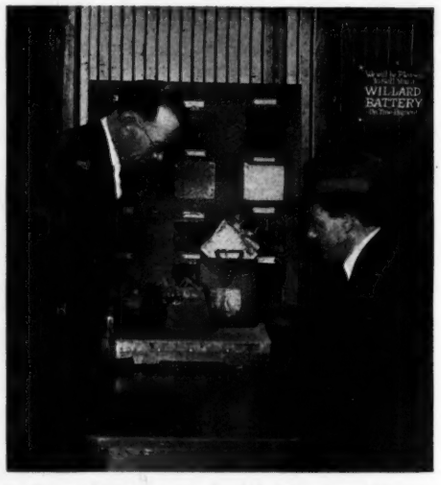


A tire placed in the center of a large gilded frame, with a velvet curtain as a background, featured an attractive tire display window which was recently put on in the accessory department of the Harold L. Arnold Co., Los Angeles.

Selling Battery Maintenance

A GROUP of individual booths where salesmen may talk with customers and demonstrate a battery has been installed by the Western Auto Electric Co., Los Angeles. These booths, in their general construction, closely resemble booths in ice cream parlors. They are kept very clean and a customer may sit in them without fear of soiling his clothes.

There is a sliding door that separates the booth from the battery department. On the face of this door are plates in various conditions, which the salesman may readily refer to should the occasion arise when exhibits are necessary in dealing with a customer. When the salesman desires a battery, he lifts the sliding door and a battery is rolled through the opening onto the desk on a sliding tray.



Planning a Small Building That Will Grow Up With the Business

Keep the finished job in mind so that the first part will not have to be done over

IN the Summer Service Number of MOTOR AGE an article appeared which pointed out some of the best methods of constructing a small building that could be added to and enlarged as business grew but with minimum of alteration expense.

The plans here shown are a concrete example of the principles referred to in the article. The man who is building this garage wants a second floor shop for general repairing, believing it far superior to a first floor location for many reasons. He also wants to store as many cars as possible on the first floor 50 ft. by 50 ft. leaving room for a small office. One of the problems encountered was the placing of the elevator in so small a building, so that it would not interfere with everything else and still be convenient to get onto from the first floor and off from the second.

Later he wants to add to the storage capacity and will probably take on car sales if it is then advisable.

He is not hampered by a shortage of land so most any plan that accomplishes the results will fit.

As pointed out in the article mentioned, due consideration must be given to the future and in this case it has proved a life saver for the layout of the first section in that it solves the elevator problem.

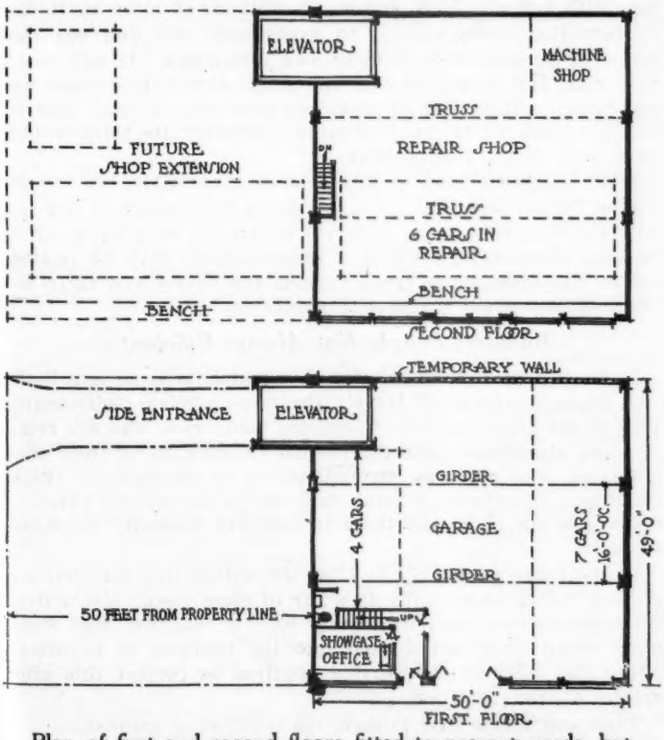
An elevator is much more convenient if set back to allow easy turning in front and it was discovered, when the addition was planned, that the elevator could be placed between two aisles leaving plenty of space at both sides. This necessitated building half of the elevator enclosure outside the 50 ft. square but this was economy in the end, since its walls could be made permanent.

Ordinarily the initial section would be placed on the corner, but here the showroom was a future consideration, and so, rather than build the corner with a garage entrance to be changed later, it would be advisable to place the garage entrance in its final position and leave the corner free to be developed later.

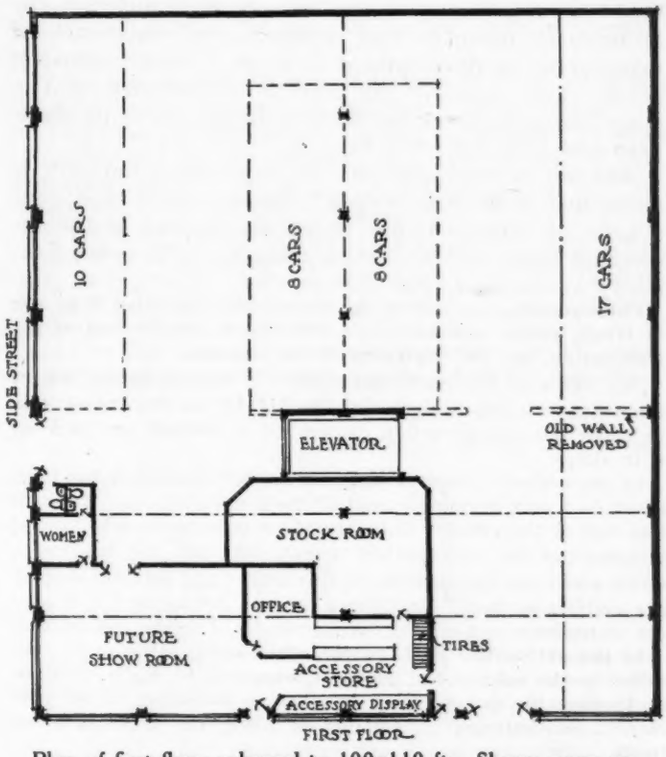
The placing of a stairway will depend upon whether the second floor is carried to the extreme rear or stops at the elevator. That is a minor consideration, however, and may be determined by the final second story layout.

Although this construction will cost more, it would be advisable here to use 40 ft. steel girders to carry the second floor in order to make the small storage space as convenient as possible. Posts could be used but would be considerably in the way on account of the limited space.

The roof should be trussed for the same reason that is given above, namely to leave the floor post-free for the freer movements of cars.



Plan of first and second floors fitted to present needs, but so placed that it will take additions with few changes



Plan of first floor enlarged to 100x110 ft. Shows room on corner. Accessory store and large storage garage in rear entered from both streets

If others contemplating building with the idea of enlarging would try to look into the possibilities of the future instead of focusing on the present needs, much valuable time and considerable alterations expense would be avoided.

No instinct of prophecy is needed, neither is one obliged to make any difficult calculations, but it is necessary to think ahead and determine what will eventually be wanted so that the present needs may be supplied if possible in their final position.

Often this will best be done by starting at the back instead of the front but every problem seems to be different from the other and each must be solved in its own way.

Evolution of the Automotive Dealer and His Functions

IN ordinary lines of retailing, service is a subsidiary part of the sales transaction. The main function of the retailer is to provide a reasonable selection of commodities in a convenient store; to see that customers know something about the commodities; and to sell and deliver the articles to them.

In the automotive field, however, the value of the retailer is measured by his effectiveness in keeping the car or truck running or in adding to the efficiency, convenience, or comfort of using the transportation itself.

By HARRY TIPPER

(Written for Automotive Industries)

THE term "automotive dealer" is not thoroughly expressive of the automotive retail establishment and the work which must be done in this field, because the term is too strictly limited to an understanding of selling. It has been pointed out that the automotive business had revolutionized the work of manufacturing development in several ways because it is the first time in the history of industry that a complicated machine has been sold in enormous numbers and used by amateurs.

The whole retail field in the automotive industry is concerned with the sale and maintenance of a unit system of transportation under the control of the individual and available for his purposes with great flexibility and convenience.

Consequently, the sale of the merchandise, whether it be car or truck, parts, accessories or supplies, is not the end of the transaction, but the beginning of the contact.

The value of the particular article is subject to the use of the transportation system and the big job of the industry is to make the transportation system more efficient and to keep it in shape.

In the ordinary lines of retailing the service which has been added is a very subsidiary part of the proposition and the main function of the retailer is to provide a reasonable selection of commodities in a convenient store; see that the customers know about the commodities in this store; and sell and deliver the articles to them. In 90 per cent of the cases this closes the transaction and any further service is of minor importance.

In the automotive field, on the other hand, value of the retailer in the sale of the goods is measured by his usefulness in keeping the car or truck running or in adding to the efficiency, convenience, or comfort of using the transportation itself.

From the complete car and truck to the small accessory, every article sold in this business is measured by its value in the work of transporting passengers or freight in the most convenient, comfortable and flexible fashion.

Production Once the Chief Problem

This business in its growth was faced with opportunity so large and diversified that the big problem was to speed up the production and distribution so that the waiting public could be satisfied at the earliest date in their demands for this species of transportation. The business grew with great rapidity, revolutionizing methods and seizing upon possibilities to accelerate the speed of its own growth so that the customer could be provided with this convenience of transportation as fast as possible.

With this rapidity of growth, a great many differences occurred in this field in a larger measure than they occurred in the older fields where there has been an opportunity to settle down considerably further and where the systems have been more firmly solidified.

The number of retail establishments has grown with great speed and as a consequence of this growth the number of people coming into the business of retailing in the automotive field has been very large and the mortality has been considerable.

For many reasons the automotive field was an attractive one to the man who desired to be working independently. It was not governed by tradition. It was not slowed up by being solidified into the system. It was experimental, dynamic and and offered large opportunities for the restless man who found the ordinary course of business too slow or too monotonous for him.

The men who entered this retail field came from all lines of business with all sorts of training. They entered a business with new problems, and no set methods of doing anything, so that they were obliged to experiment and find out the best way of dealing with their own difficulties. If any business man had been told that the retail distribution could be established within 15 or 20 years and grow from a small experimental possibility to the third largest industry, the thing would have been counted impossible.

What has been done in this field is remarkable. It should not be remarkable that there are many differences in the retail establishments, many different tendencies running parallel to each other among which a manufacturer may be misled unless the strength of these various tendencies and their directional movement is thoroughly understood.

Business People Not Always Efficient

There is a general impression that people who go into their own business represent largely the more efficient individuals. This is not altogether so. There are many men who are restless and dissatisfied with the ordinary conditions of their employment, who will find an opportunity to escape from these conditions by entering a retail field where the capable requirements are not large and there is apparent necessity for more workers.

In the years from 1910 to 1920, the automotive field offered a great visible opportunity to many of these men. Mechanics, salesmen, restless men from other lines of business, men from other retail lines—all flocked into the business of retailing, either the sales or the service required to perfect this unit system of transportation.

These conditions have brought the retailing of automotive apparatus and service to the point where the problem begins to

show itself and the retail establishments must define themselves into a more orderly system in order to meet the future requirements. In other words, the work done by the retail establishments in the automotive field in the rapid growth up to 1921 has not been at the maximum requirements or concerned with the maximum problems of the field. During such a rapid growth, many elements became involved in the field and many tendencies visible that are simply elements of growth and may pass out when the field defines itself more clearly.

The depreciation in 1921, coming as it did, after a period of unparalleled growth, has caused the manufacturer, the jobber, and the retailer to question and to analyze. This questioning analysis is resulting in the experimental development of many new alignments or realignments in the endeavor to secure a more efficient distribution or a more concentrated service value. These new alignments are not always developed along sound economic lines and some of them may only add to the confusion in the field instead of defining and simplifying. The present conditions to be observed are these:

1. The number of retail establishments in the automotive field is very small in proportion to other lines of business for the amount of money and effort involved, and it is probable that the number of retail establishments should be considerably larger in order to do all the work required for the maximum service of this unit system of transportation.

2. There are two apparently divergent tendencies to be observed in retailing:

(a) The tendency to operate specialized shops

(b) The tendency to operate departmentalized establishments.

These tendencies need to be carefully weighed and considered in order that their significance may be understood. There are stores devoted entirely to supplies, accessories, etc.—sales establishments entirely. There are retail establishments devoted entirely to radiator repairs, machine repairs, electrical service, etc. There are also many retail establishments carrying an accessory department, a repair department, space for storage, and the other necessary elements for the work of keeping the automobile and the truck running.

A general examination of the situation shows that the departmentalized establishments are growing more rapidly than the specialized establishments, and they represent a very much greater proportion of the worth-while retail development. This is a logical tendency because the bulk of the automotive transportation equipment is owned in the smaller towns and cities—where the departmentalized establishment possesses only sound and large possibilities of growth in development. The logical sound development of the business in all except a few large cities of the United States is along the lines of well organized, departmentalized retail establishments capable of providing the car owner with his new cars, his service, his supplies, his repairs and maintaining complete contact with the individual customer.

The Dealer Mortality

One of the elements of greatest importance in the retail field has been the mortality among retail establishments and therefore the greatest difficulty in the manufacturer's maintenance of the proper distributing outlets, both in character and in number. There is a good deal of misconception concerning this mortality. Many of the manufacturers in the automotive field appear to be under the impression that the mortality in this field is entirely out of line with the other retailing fields.

The mortality in the automotive field is higher than it is in the older retailing fields. It should be considerably higher on account of the rapidity of its growth and the very few years of its existence. It is not very much higher, however, and the indications are that in proportion to its age, it possesses as much stability as the older fields of retailing. In the investigations conducted just before the war the average percentage of grocery and hardware stores operating on insufficient capital reached between 30 and 35 per cent, and in the large cities the mortality in this type of store was very considerable. It is estimated that approximately 40 per cent of the retail establishments in the automotive field are insufficiently capitalized, have no credit, and are therefore of doubtful stability, while the actual mortality in the field is estimated at about 30 per cent.

While this mortality is not startling, it is a very important question to the manufacturer because it means that upward of 20,000 dealers went out of business in 1921 and as many or more, came in. All manufacturers are interested in limiting the losses involved in this development and maintaining themselves in the retail field in accordance with the increasingly efficient and stable elements.

The field of retail establishments should be analyzed, not only as to present conditions and stability, but also as to the probable future developments, so that the contact of distribution can be maintained without feeling the full effects of the mortality nor the various difficulties involved in the experimental tendencies to be observed in the automotive industry.

A New Prospect Card Theory

SHORTLY after the beginning of the new year the H. L. Arnold organization, Hudson and Essex dealers in Los Angeles and Los Angeles county, California, completely junked all prospect files and prospect lists, which have been a part of every automobile dealer establishment since motor vehicles were first offered to the public. The salesmen were informed that the system whereby a salesman could obtain a "monopoly" on a prospect by filing on him was banished for all time and that in the future the field was wide open to all members of the sales force, without any restrictions on calls.

In the three months since the Arnold company did away with prospect files, there has been a substantial increase in sales, according to F. H. Shreiner, salesmanager of the dealer establishment— an increase which justifies beyond dispute the wisdom of the revolutionary step that was taken.

"When a salesman knows that he can 'sew up' a prospect by filing the prospect's name, there is no particular incentive for him to work hard to negotiate a sale at the earliest possible date," said Shreiner. "I had long been convinced that the system of filing on prospects in the automobile business as in other businesses was all wrong and that it serves to stifle energy. The salesmen, having filed on a prospect, is secured against competition from other members of the sales force of the house employing him, and he knows that if the prospect is to purchase the car he handles, the sale must be credited to him.

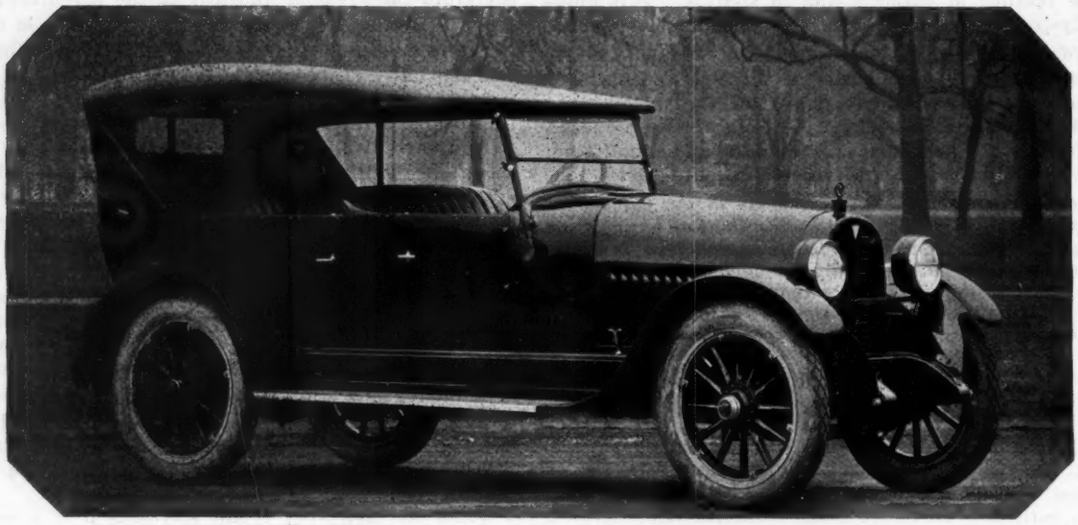
"Under the plan on which we are now working, all salesmen have the privilege of calling on whom they desire. When one salesman knows that another salesman working for the same house is perfectly within his rights in selling a prospect cultivated by another if he chances to run across him, there is a tendency for the men to be right on their toes all the time.

"We proceed on the theory that a person is a 90 per cent prospect on the first call of the salesman—either 90 per cent good or 90 per cent worthless. Prospect files tend to greatly restrict the number of new calls that a salesman can make, because the salesman will invariably file names of persons whom they do not intend to see for weeks or months. On the second call a prospect is viewed by us as 98 per cent either way, and on the last call 2 per cent. It is the first call that is the most important and if our men cannot complete sales during the first call it is up to them to arrange the next call at as early a date as possible in order to avoid competition from another salesman representing the firm.

"We have been really amazed at the new energy that has been loosened in our sales force since we did away with prospect files."

New Hudson Uses Aluminum Pistons

Front End Drive is by Morse Chain—Roller Tappet Assembly Replaces Mushroom Type—Flywheel Made Lighter Without Sacrificing Smoothness



Hudson super-six touring car illustrating altered appearance due to lowering of top, adoption of new headlamp design and other minor alterations

DUE to a number of refinements and changes, the Hudson super-six engine has been improved in performance and quietness. The changes cannot be considered radical, with the exception of the crankshaft and cylinder block. It will be remembered that not later than last fall, the cylinder block itself was revised, particularly in regard to the internal gas passages with a result that better vaporizing was obtained.

Probably the most significant change is the adoption of aluminum pistons. This piston has been worked out so successfully on the Essex that a design of practically identical nature has been selected for the Hudson. The manufacturers feel that in this type of constant clearance piston, previous objections to aluminum pistons have been overcome because of the possibility of using small initial clearances and because of the fact that the constant clearance feature eliminates the difficulties, due to the high co-efficient of expansion of the metal. Some change has been made in the piston, both in the Essex and Hudson cars to guide the oil to the piston pin. The pin is now a full floating type.

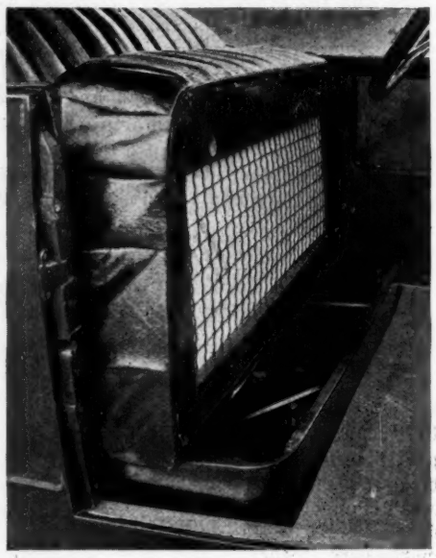
Some idea of the weight which has been saved in the new piston may be gained from the fact that the iron piston weighed from 32 to 40 oz., the latter being the heaviest oversize, while the aluminum weighs but 16 to 16¾ oz. The weights on the piston are held within the limit of ¼ oz., and the rods ¼ oz. The piston pin is locked against end travel by means of rings in the piston boss. The piston pin is ⅜ of an inch shorter now in order to allow it to fit inside of the lock ring.

Change in Front End Drive

Another important change on the engine is that the front end drive, instead of being by gear, is now Morse chain. In this installation the water pump sprocket rotates as an idler on a bronze adjusting eccentric which is drilled off center. The drilled opening takes the water pump driveshaft. The floating bronze member is driven off a driving flange on the sprocket and there is a floating member flanged to take the fixed portion of the coupling.

This is drilled and keyed to connect with the water pump shaft which is also pinned to the fixed coupling member. To adjust the center distance between the sprocket centers on the chain, the adjusting flange is rotated. The use of this modified type of Oldham coupling allows the fixed portion of the drive to have a relative sliding action across the driving face on the floating member, due to the throw of the eccentric. This sliding portion is lapped to give a perfect sliding fit.

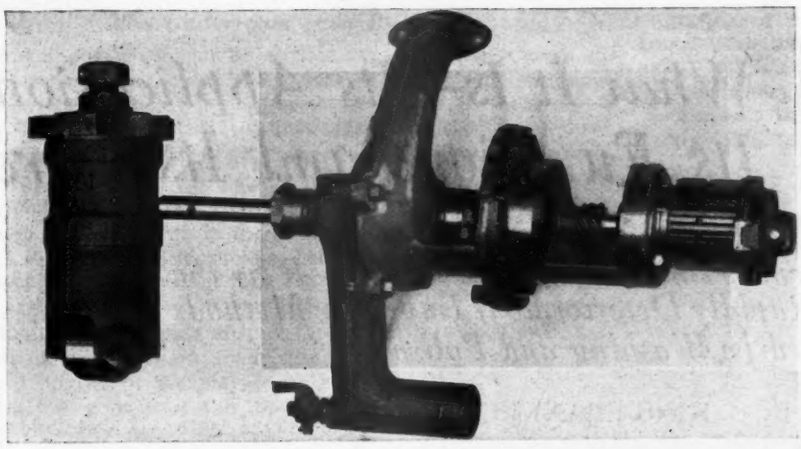
Quietness has been gained by adopting the roller tappet system in place of the mushroom tappets. No pains have been spared to give an accurate assembly for the roller tappets. For instance, there



On the new Hudson bodies, the seats are doweled into place instead of being retained by the customary trim strip

are three grinding operations on the roller pin held to a limit of .0005 in.

Due to its system of counter weighting, the Hudson engine has had a reputation for smoothness and freedom from vibration. In spite of the fact the flywheel is somewhat lighter, no noticeable vibrations can be detected in the engine. A representative of this publication witnessed a demonstration in the final block test in which a nickel was placed on edge on top of the cylinder block of an en-



Left—New Hudson roller tappet assembly which replaces the former mushroom type

Right—Water pump driveshaft assembly showing the eccentric adjustment for the Morse front end chain drive

gine running at 2000 r.p.m The vibration was not sufficient to upset the nickel at this speed.

Compensation for the lighter flywheel is made up by the fact that the crankcase has been materially stiffened by a new system of internal ribbing and the use of more metal in some of the dimensions. Furthermore, the crankshafts are now put in running balance on an Olsen type of machine which accurately measures the out of balance factors and designates the point from which metal must be removed and gives the weight of the material to be taken out, to put the shaft in both static and dynamic balance.

A number of other manufacturing refinements have been made, one of which is the use of an automatic cam lathe. This is a Melling cam lathe made by the Walcott Lathe Co., which turns 25 camshafts per hr. This has taken the place of three other machines whose capacity was but nine per hr. The new camshaft lathe turns all 12 cams at once. The former machine used turned only six, after which the camshaft had to be shifted for the turning of the other six.

Speed in Manufacturing Operation On Piston

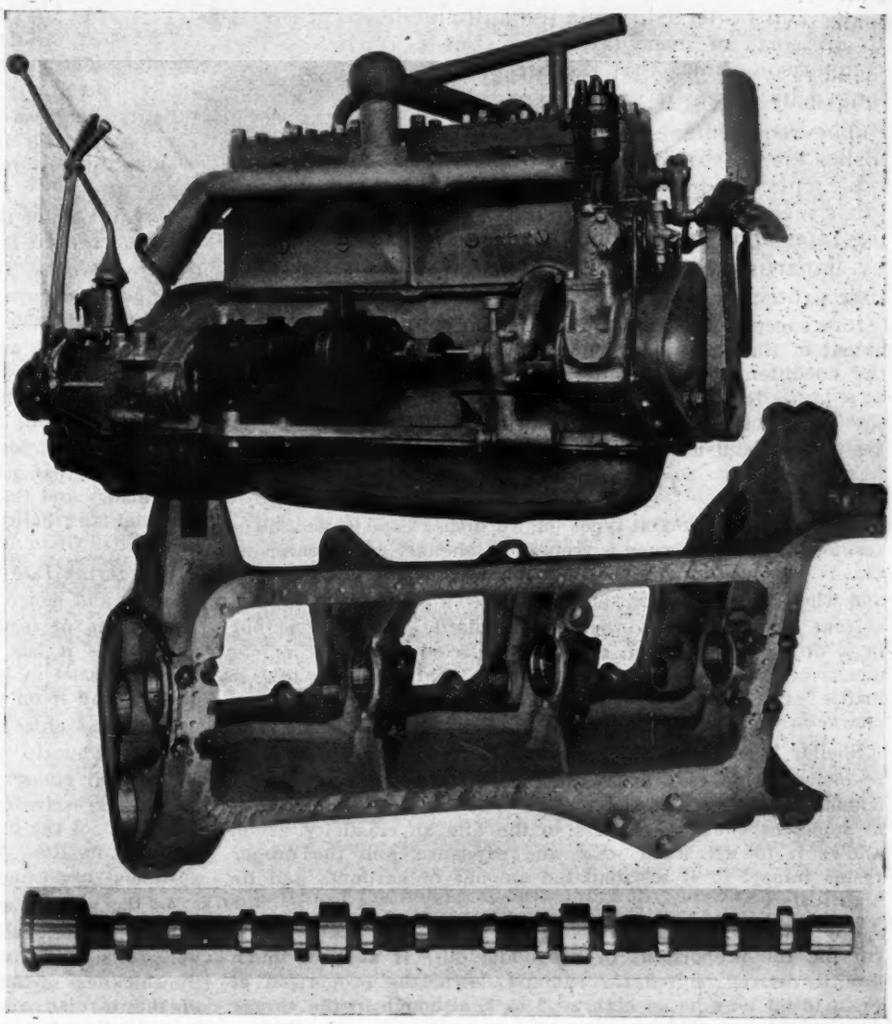
Another interesting manufacturing operation in connection with the engine is that used for turning the pistons. With this machine, one of the aluminum pistons is rough turned in 14 sec. This is considered to be probably a record for this type of piston. This is an automatic machine and practically finish forms the piston in one operation from the blank.

In addition to the changes in the engine, the bodies have been refined in a number of details. In a number of places, woodwork has been removed from the framing of the body and metal stampings employed instead. This is particularly true of the sills upon which the seat cushions rest and in place of the trim strip holding the seat in place, dowel pins are now employed. The seating has been rearranged and the contour of the upholstery improved to give more comfort and the battery, instead of being hung in the body, is now hung in the chassis under the seat.

A change which has altered the external appearance to some extent is the elimination of the bevel edge. This is true of all bodies now except the Essex, even the four-passenger Hudson which has been known for its characteristic bevel edge, has a straight edge body. The bodies are somewhat lower in appearance, due to a lower top and a lower windshield. The body hardware has been improved in detail and the front compartment is now provided with a rubber mat. The robe rails are a new type and the instruments are mounted on a contoured dash cut-away for increased leg room.

MAXWELL PRODUCTION INCREASES

Detroit, May 6—Production of the Maxwell Motor Corp. for the first quarter of 1922 was 340 per cent more than for the first quarter of last year, according to a statement by President William Robert Wilson. About 2500 men have been added to the payroll since the first of the year. Many departments are working day and night and much new machinery has been added to stimulate production.



Top—Hudson super-six engine which has been revised in detail practically throughout
Center—Crankcase now used on Hudson super-six engine. This is a more heavily ribbed and stiffer structure than the previous one
Bottom—New Hudson super-six camshaft adapted to roller tappet

FINISHING VARNISH | *What It Is—Its Application Its Functions and Its Care*

Knowledge of Varnish Important to the Dealer—Why the Paint Coats Will Rapidly Deteriorate if Improper Methods Are Used In Washing and Polishing

By G. KING FRANKLIN

THE use of varnish as a protective coating dates back thousands of years. The oldest in existence is supposedly on Egyptian mummy cases whose ages are some 1500 years. Analysis show it to be a compound of drying oil and resin—in other words similar to the best made today. All of which goes to show what may be expected of good varnish; and when it is said that the average life of finishing varnish on an automobile is about one year, the contrast becomes pronounced. Of course, the mummy cases were kept inside and protected, while the automobile is subjected to all sorts of everyday abuse, but nevertheless the comparison shows that the life of varnish can be prolonged by giving it proper care.

The requirements of the present day finishing varnishes are so varied and exacting that their production represents the best of the varnish maker's art. They must meet the needs of modern shop practice in drying rates and ease of application—decorate the surfaces by imparting to them a high luster, and at the same time protect them from without.

How successfully a finishing varnish does this, and for what extent of time, depends not only upon the varnish itself and the conditions of the paint coats beneath it, but also, and to a large degree, upon the care and attention given to it by the car owner. The purpose of this article is to tell you something about finishing varnish and its weaknesses.

Two Main Varnishes

There are two main types of varnishes—spirit and oleo-resinous. In the former a resin, like shellac, rosin, dammar, etc., is dissolved in a volatile solvent like alcohol, benzine, etc., and when the solution is spread out over a surface the volatile solvent evaporates leaving the non-volatile resin spread out in a uniform film. The solvent has acted as a mechanical means of evenly distributing the resin. This resinous film is brittle and possesses no wear resisting qualities such as characterizes the latter type.

Shellac is a type of spirit-varnish familiar to all. The oleo-resinous varnishes are, as their name implies, largely compounds of drying oils and resins. The use of the drying oil in sufficient quantity imparts to the film an elasticity which allows it to withstand wear and exposure, and the proper resins impart to it a calculated amount of hardness and its high luster.

The elasticity and hardness of the film can be regulated by varying the proportions of resin and oil. If a hard, tough film is desired, suited for rubbing down, the proportion of resin to oil may be as high as 2 to 1, although in the slower drying materials this may be as low as 1 to 1. If a tough, elastic film is desired, possessing wear resisting qualities more oil is used until the proportion becomes as high as 1 to 5—that is 1 part resin to 5 of oil. The oil furnishes elasticity and durability and the resins hardness and brilliancy. The first type is known as rubbing varnish and the latter as finishing varnish.

Practically all of the resins used in the manufacture of these oleo-resinous varnishes are of vegetable origin, obtained from fossil deposits or the saps of trees. As now used, copal is the general term that includes all of the five main types—East African, West African, Manilla, Karui and South American. Their main difference lies in their varying degrees of hardness, and as a rule the harder the resin the better the price it commands.

The Qualifications of Linseed Oil

The most popular drying oil is linseed oil, and this popularity is due to the fact that it combines readily with resins and will itself dry to a tough, leathery film possessing wear resisting qualities and soluble only in strong acid or alkali. The so-called drying oils, such as linseed oil, are distinguished from the non-drying oils by the fact that the former oxidize and harden when exposed to the air.

Were it not for the drying oils there would be no such paint or varnish, as it is their oxidized film that furnishes the protective coating. Tung oil is another important one but the rest, such as soya bean, fish, corn, etc., are used chiefly as adulterants of the higher priced linseed.

While the oil and resin may be said to play the leading roles there are two other materials used in the manufacture of these oleo-resinous varnishes that play important parts. One is a solvent, such as turpentine, which is added to the cooked oil and resin mixture in order to thin it down to a consistency that will allow its being properly applied by the workman. And the other is a drier that is combined with the material and helps in the oxidation of the oil when exposed to the air.

The drying rate of linseed oil is too slow for modern shop practice and hence the need of something that will quicken it. The oxides of lead and manganese are well suited for this purpose as it has been found that when combined with the oil they assist in its oxidation by taking oxygen from the air and passing it on to it.

The chief objection to their use lies in the fact that they often continue to work after the oxidation of the oil has progressed far enough for general purposes, and especially so if used in excessive quantities. Such over-oxidation results in a "burning" of the film that cuts down its elasticity and thereby shortens its life. That is one reason why the slowest drying varnishes are usually the most durable.

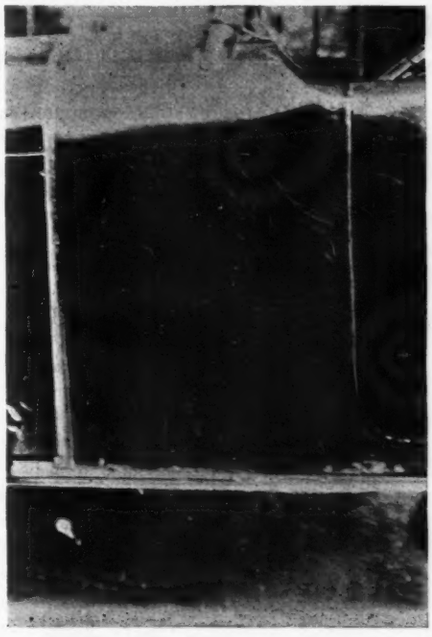
As the solvent evaporates soon after the varnish is spread out over the surface, it is apparent that the varnish film will consist of oxidized oil, resins and driers. And while the thickness of this film will vary according to the consistency of the varnish and the method used in applying it, it may be said that one thousandth of an inch can be taken as the average thickness of a finishing coat. Not much when one stops to realize that the finshing coat is the only protective covering on a paint job, but enough while it maintains its elasticity; and when this is gone it must be renewed.

The Undercoats Must Be Good

Finishing varnish can be applied repeatedly over good undercoats and the life of the paint job indefinitely prolonged thereby. But there is nothing to be gained by applying it over faulty undercoats. It cannot make a poor paint job good, diseased undercoats well, fill cracks or inequalities, stop checking, chipping or discoloring. If applied over defective surfaces it is subject to attack from within as well as from without.

Such a job is shown in the accompanying photo. These surfaces show premature cracking because of faulty workmanship —most likely insufficient time allowed some of the undercoats for drying—and it should be evident to all that no amount of finishing varnish could correct the condition. To those interested in reading more about the particular structure of a paint job we recommend the article in the December 15 issue of MOTOR AGE.

Practically all of the materials used in automobile painting are varnish products. The rubbing varnish and finishing varnish are both oleo-resinous products made to dry with a hard or elastic film according to the requirements. The last coat applied to a paint job is a varnish coat possessing elasticity so that it will wear. It is the finishing coat and the varnish used is called finishing varnish. It is the only protective coat as the undercoats have all been built to perform some other duty and must have protection in their work.



Finishing varnish is of no value if applied over defective undercoats. It can be applied repeatedly over good undercoats and will prolong the life of the paint job. Photo courtesy of the Chicago College of Auto Painting.

Experience

If the car owner will protect and care for the finishing varnish on his car, it in turn will care for and protect its undercoats. Its care involves the application of new when needed as well as the observance of certain rules that determine its span of life. For, as previously stated, its term of usefulness is limited to about one year with average service, but with abuse this can be appreciably lessened. The application of finishing varnish is very particular work, and should only be attempted by the experienced automobile painter.

So much for the material itself, and now for a few pointers on the care and attention that should be given to it:

When to Re-Varnish

Finishing varnish that has lost its luster is in need of revarnishing. If small hair-line cracks can be detected around the panel edges it is an indication that the varnish is drying out and losing its elasticity. So long as these cracks do not penetrate the undercoats they can be removed by rubbing and the surface revarnished, but if neglected and allowed to widen and deepen revarnishing can no longer be properly done. A surface should be revarnished when lusterless or when the cracks developing in it lie only in the finishing varnish and can be rubbed out without loss of time. Assuming always that the undercoats are in good condition.

Heat and Cold

The very nature of the varnish film shows one that it is susceptible to heat and will soften if exposed to it long enough. Washing it with warm or hot water should therefore not be attempted. Cold temperatures have a chilling and hardening effect which are more desirable. Sudden changes in temperature effect all coats—thus when a car is driven from a warm garage to cold weather outside and vice versa, or when warm water is used in washing a cold body and vice versa, the different paint coats must quickly respond. If not properly matched for elasticity separation takes place and chipping or flaking off follows.

Mud, as a rule, contains little free alkali that will attack varnish so that if washed off while wet little harm can result. But if allowed to become dry while on the varnish film, it will, through capillary attraction, suck the life from the particular area that it covers and leave it spotted.

Ammonia fumes are given off from manure piles, and for that reason a car can not be housed in a stable without affecting the varnish. Surface water on poorly cleaned city streets may also contain ammonia and if splashed over a body will spot it.

Water

When finishing varnish whitens the condition is most always caused by prolonged contact with water. At first this is an optical illusion. The varnish film is hygroscopic, that is it absorbs water, and when the water particles lie alongside varnish particles the light rays that strike them become so distorted that whitening is the result to the eye. Just as when a piece of glass is scratched and the scratched places looks white. If the water is allowed to dry out the normal color of the varnish re-appears.

If, however, the water remains in contact with the varnish particles long enough for a chemical reaction to take place between the two, then an insolute white hydrate is the result which causes a permanent whitening and requires the attention of the automobile painter. The temporary whitening effect cannot always be prevented as the ordinary car is subjected to a great deal of exposure, but it can be overcome to some extent by sponging off any water from the varnish and giving it ample opportunity to dry out. The so-called spar varnishes are water proof, but their poor working properties prohibit their general use on bodies. They can be used successfully on the chassis and wheels.

Polish

There is no substitute for finishing varnish wherever it can be used, and lusterless surfaces should be revarnished. Surfaces that have been polished with polishes that leave a film on the surface require special treatment before they can be revarnished or repainted in order to keep the polish ingredients from mixing with the paint. Materials that act only as cleansing agents are not so objectionable, as they leave no residual film.

Washing

You have been shown that a varnish film is softened by heat and is then easily marred in washing, and also that it is soluble in strong acid or alkali. From which you can see that a soft varnish film should be chilled with cold water in order to harden it before sponging or chamoising, and that no strong soap should be used for the work. On the body panels no soap at all is required. On the chassis a vegetable oil soap, such as green-oil soap, can be used if desired, but some washers dispense with it entirely. They use a slow stream of cold water on the body to flow off the surface dirt—then come back over the panels with it again, following along with the tips of the fingers to make sure that no dirt particles remain, and then once again with a clean sponge applied very lightly.

This removes the danger of scratching the panel with any of the surface dirt as if the sponge were applied first. Or if not very dirty the use of sponge can be eliminated. In washing the chassis a separate sponge is used and where grease is found it is removed by adding about a quart of gasoline to the bucket of water. Mud, of course, is removed by first soak-

ing and then hosing off. Road oil on baked-on enamel parts, such as most fenders, can be removed with benzol, but this should not be used on air-dry paint as it will attack the paint as well as the road oil. Special prepared solutions can be had for this purpose. In chamoising a surface it should be remembered that the chamios is only used for the purpose of picking up any surplus water remaining on the surface.

Chamoising should not be done by a vigorous rubbing of the surface as this will scratch the varnish. It should be folded and brought lightly across the surface in one direction only with just enough pressure to pick up any surface water. Separate sponge and chamois should be kept for body use and they should be kept clean. Many brand new cars show the effect of too much sponging or chamoising on the body panels, for the varnish film is still soft and easily marred. Repeated showering with cold water will help to harden it—and the use of both sponge and chamois should be reduced to the minimum.

A Paint Department

The service field on paint and varnish is under-developed and there is a splendid opportunity for every dealer to get organized to handle this profitable work. There is no doubt about there being plenty of work at hand and the only thing necessary to obtain is the "know how." MOTOR AGE told you how to get such a department under way in the Nov. 3 issue, and everyone with a desire to add one to their present lines of endeavor will do well to read the article on page 32 therein.

Program of S.A.E. Summer Meeting Drafted

THE technical program for the summer meeting of the Society of Automotive Engineers at White Sulphur Springs, June 20 has been practically completed. Five sessions have been decided upon to be devoted to research; fuel and engines; passenger cars; aeronautics and motor buses.

A report from the Research Department of the Society will be presented by Dr. H. C. Dickinson. This report will treat principally the motor-fuel-volatility and highway-research projects in which the society has been participating. Fuel tests which are being conducted as outlined by the research department, the Bureau of Standards and the Bureau of Mines with the full support of the National Automobile Chamber of Commerce and the American Petroleum Institute, will be described.

W. S. James of the Bureau of Standards will present a paper describing tests now under way as a part of the S. A. E. fuel research program. He will describe a device perfected by the bureau which records graphically the fuel consumption of a passenger car while it is being operated under ordinary driving conditions. An analysis of records kept over a long period reveals some rather unusual facts which command the attention of all who covet an increased number of miles per gallon.

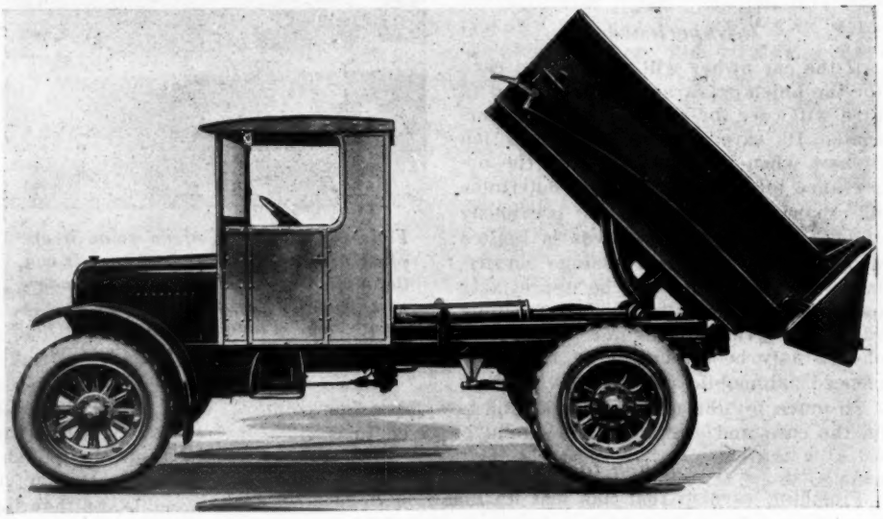
In the fuel and engine session, Thomas Midgley, Jr., will submit some data on the characteristics of blended fuels. Two papers will be contributed on the pumping of oil in engine cylinders, a current problem demanding special study. One of these will be presented by an engine designer, A. A. Bull, and the other by a lubrication engineer, C. A. Round. A paper on the present status of the hot-spot method of handling fuels of low volatility will be presented by F. C. Mock.

Novel Spring Suspension

In the passenger car session, H. M. Crane will present a rather novel design of spring suspension for discussion. The wider adoption abroad of overhead camshaft passenger-car engines may indicate the tendency of future engine design in this country and a paper on the subject will be presented by P. M. Heldt. J. B. Bray will present some constructive criticisms of the engineer's present attitude toward maintenance work.

The aeronautic session will include papers on several phases of aircraft progress. Only two of these can be definitely announced. Capt. G. E. A. Hallett, of the air service engineering staff at McCook Field will describe the methods followed by the air service in the design, experimental construction and testing of its new engine types. Prof. E. P. Warner will discuss a method of estimating airplane performance.

Two papers have been scheduled for the special motorbus session. G. A. Green will treat of the important factors that influence bus design and construction. R. E. Plimpton will submit data showing the unusual growth of bus transportation and compare the many types of bus chassis now produced, indicating the particular service to which each is suited.



Dump Body for Ruggles Two-Ton Truck

The Ruggles Motor Truck Co., Saginaw, Mich., announces a new dump truck for use in handling coal, dirt, gravel and other materials. This new equipment consists of a Woods' steel dump body mounted on the standard Ruggles two-ton chassis and equipped with the Woods' horizontal hydraulic hoist. The dump body has a capacity of one and one-half and two yards.

The Ruggles two-ton chassis used with this dump body truck has a 38 h.p. Ruggles-designed engine with four in. bore and five in. stroke. The rear axle is a Ruggles double reduction with air-tight steel housing to protect the working parts from dirt, water and other harmful substances. The driver's seat is roomy and very comfortable with deeply padded cushion springs and plenty of arm and leg room. Standard equipment on this truck consists of oil lights at front and rear, tools and kit, including jack, wheel puller and hand tire pump, seat and cushions, hand horn.

R. & V. SHIPMENTS LARGE

East Moline, Ill., May 6—Shipments of the R. & V. Motor Co. in the last month have exceeded those of any other month in a long period, according to officials of the company. Employes recently voted against a daylight savings schedule by a majority of 21.

COLLECTION BUREAU

Chicago, May 5.—The Chicago Garage Owners' Assn. has installed a collection bureau for the use of its members. The bureau also will serve as a credit information department for members.

Various Plans *for* Solution *of the* Used Car Problem

This Condensed Review of the Several Plans for Handling Used Cars Was Prepared as a Part of the National Automobile Chamber of Commerce Campaign for Education. Several of These Plans Have Been Reviewed Previously in MOTOR AGE

The National Used Car Company Plan

IT is said that it is because the new car salesman is seldom a good used-car buyer many think the taking of old cars in trade should be discontinued. One of the plans to bring this about in effect has been proposed by H. H. Brooks, sales manager of the Nordyke & Marmon Co. This provides another outlet for used cars. Briefly it is this:

A national used car corporation formed and operated under the supervision of the passenger car manufacturers, dealers and bankers, its sole business to be to buy, recondition and sell used cars. It will have a central headquarters with main branch houses in various zones, according to geographical conditions and potential markets. The branch houses will be reconditioning plants distributed so that cars can be driven in instead of shipped. Sub-branches will be purely retail establishments, except for minor repairs and adjustments.

The national used car company will buy old cars from automobile owners purchasing new cars.

A car owner under this plan is encouraged by the dealer to take his car to the national used car company where an expert appraises it and makes him an offer of purchase. If he accepts it he receives in return certificate of value for the amount agreed upon good for that amount toward the purchase of any new automobile made by a manufacturer co-operating in the plan.

When the certificate of value is accepted by the new car dealer and the sale of a new car is consummated the used car company will give the dealer, in exchange for the certificate of value, a negotiable note of equal value. This note can be endorsed by the dealer and used at his bank. When the used car is sold the note can be redeemed instantly and from this point the deal is to be financed entirely by the used-car company.

The used-car company will sell its car at cost, plus reconditioning, plus sales expense, plus a normal profit. A commission will be charged the dealer for the sale of the used car, which should be the same as paid a new car salesman. A new car salesman will receive, as is customary today, a commission on the amount of cash received, then the used-car company gets a commission on the balance involved when the used car is sold.

It is proposed by the author of this plan that the manufacturers support the undertaking to get it started. The factories co-operating could furnish mechanics for reconditioning their own makes of cars. All factories should sell to the company parts at extreme distributors' discounts. Further, by this plan the way would be opened to interchange cars between one section and another.

Cars fit only for the junk heap would be removed from the market.

Certified Car Plan

FOLLOWING is an outline of the certified car plan proposed by Homer McKee:

Pride and fear are holding back used car sales. By certifying the car it would be as creditable as a new one to use and as safe to buy. The plan would also remove the stigma on the used car business. The name 'used car' would be abolished and 'certified car' would take its place. Before a car would be certified it would have to be brought up to a certain standard of condition. Only N.A.C.C. members' cars could be certified and they could be handled only by regular dealers of N.A.C.C. members.

Standard insignia would be provided for Certified Car Stations and the public acquainted with this insignia by advertising, thus creating confidence in the certified car. Further, the certified car would carry a warranty.

At a certified car station a car would undergo a complete diagnosis and a detailed report would be made of its exact condition, and the cost of putting it in the prescribed condition. This would enable determining a fair allowance for the car in trade.

After repairing as recommended a Board of Examiners of dealers' representatives would register it and issue a signed certificate.

No car could be certified if the ownership title was questionable, tending to prevent the resale of stolen cars.

After proper publicity intelligent dealers would not offer nor intelligent buyers buy a car not certified.

The certification board would be composed of fair, competent, unprejudiced mechanical experts.

Fees for preliminary examination and final certification would make the board self-supporting.

The buyer of a certified car would have three days' trial. If he did not wish to keep the car he would have to have it recertified before demanding his money back.

Certified car dealers would be required to execute a bond to insure conducting their business in conformity with N.A.C.C. requirements.

National Appraisal Company Plan

A FAVORED remedy for the used car problem is an impartial appraisal of each car before it is taken in trade by a dealer to assure that it is bought right. These are the contentions of the proposer, H. C. Schwable:

To be impartial the appraisal should not be under the dealer. Neither is a local appraisal bureau controlled by a group of dealers acceptable to the public. An appraisal company national in scope and independent of the dealers has better chance of securing public confidence.

The plan is to establish appraisal stations in say New York, Chicago, Philadelphia and one middlewest city. Every car to

be thoroughly examined and a record of its condition made part of the appraisal certificate, not only supplying data for estimating the present value but also forming a basis of determining the cost of reconditioning.

The headquarters' office would supply the manager of each station with data concerning the market. As part of the appraisal contract the owner of a car would agree to inform the appraisal company when and to whom the car is sold and at what price. The dealer who handles the car also would be required to return a blank when he sells the car giving name of customer and price as well as giving cost of reconditioning.

An appraisal certificate would be sent to the dealer who made application. It would be delivered to the owner only in case no dealer was involved in the appraisal and then at a price 50 per cent in advance of the cost to the dealer.

The price charged dealers agreeing to submit every car offered would be $10 per appraisal; others $15.

With every appraisal the owner would receive vendee and vendor forms, properly made out for execution with the dealer who takes the car. Also the dealer would receive a form of card-cabinet size in duplicate, one card to be returned to the appraisal company when the car is taken in and the other when it is resold. The dealer may file his copy as a complete list of used cars available in case one of certain description or price was wanted by the customer of any dealer.

While there would be no agreement by the dealer as to the price he would allow for a car he would avoid all doubt as to its true value by adopting the appraisal valuation as the price at which he would sell as is, or add only the cost for reconditioning.

As most dealers find it easier to sell used cars of makes they handle exclusively, some would trade cars with one another at appraised valuation. If some dealers develop salesmen or sales methods that would sell more used cars than they took in trade they would buy from other dealers at reasonable discounts from trade valuation.

If the automobile industry would support the appraisal company valuation at the beginning in a short time it would become authoritative.

If dealers did not give away profits in over-allowances they could sell parts and service at reasonable prices, to new car owners. Fixed prices can be determined for most jobs frequently performed in maintenance stations, prices that avoid the risk an owner takes when work is charged for by the hour. Manufacturers may offer this boon to purchasers of cars if they will foster a plan to prevent their dealers becoming almost bankrupt due to used car losses.

The appraisal company would run a campaign of newspaper advertising offering its service to (1) owners trading cars or selling to others than dealers (2) those buying used cars (3) those contemplating purchase of a used car who wanted to know the worth of their used car and (4) those wishing to estimate the cost of overhauling their cars.

The promoter asks for a sum sufficient to organize the project, this sum eventually to be spent entirely in publicity.

Dealers would be asked to sign a contract for six months or one year to have every used car appraised by the company before they buy, trade or sell it, the dealer agreeing to pay the appraisal company $10 for every appraisal. He must pay in advance for 100 appraisals and agree that only half of the appraisals made for him in any week are to apply on his advance payment account.

This is the plan for financing the original installation of an appraisal station in each city and to assure the project a fair trial period. The appraisal company would have to conduct its business so that when 200 appraisals had been made to any given dealer he would be so well satisfied he would contract for another period.

The Scranton Plan

ANOTHER plan that is interesting is what is known as the Scranton plan—a combination of the Indianapolis, Saginaw and Hartford plans focusing in a sales board.

It calls for "a personal estimate quarterly from each dealer of the proper selling price for each of his last five years' models in good condition, to be sent all member dealers, as bases for trades after deducting reconditioning cost, if necessary, and 15 per cent selling and handling charge.

Meetings to be held weekly.

Estimates made by members of cars handled by non-members to be averaged and listed.

No car over five years old to be traded.

Each dealer to report weekly his used car sales and inventory, affording barometer for allowance prices.

Dealers resell at cut prices from list for reasons of their own, after advising the governing board.

Cars exchanged within 60 days of purchase new to be exempt from these rulings.

Factory-Advertised Used Car Values

W. P. DISBROW of New York has a plan to the effect that:

Each factory advertise the current value of its previous models in good condition. He would have the information obtained by dealers reporting their second-hand car sales to their factories. These would be combined and averaged by zones and issued to dealers quarterly affording them a guide for trade-in allowances. The advertised figures would be the sales price less reconditioning cost and 15 per cent margin for handling.

To insure dealers keeping within the prescribed allowances he proposes that a clause be written into all future contracts between manufacturers and dealers.

To cover "selling them right," Mr. Disbrow advises having the used-car organization of the dealer entirely separate from his new car business and of equal efficiency. All makes of used cars not over four years old thoroughly reconditioned and guaranteed. Co-operation between dealers on parts prices would be necessary to keep reconditioning costs at a minimum. Everything possible must be done to remove the stigma of the term 'used car' from the public's mind and imbue it with confidence in the rebuilt motor car offered for sale by the reputable dealer.

Used Car Auction Plan

ANOTHER way of determining the market and at the same time moving the used cars is proposed by A. B. Cumner, general service manager of the Autocar Sales & Service Co. Ultimately he believes that a dealer should trade in and recondition only the cars he handles as selling representative. As a temporary expedient, however, to dispose of other than the dealer's own lines, which, for convenience, he calls "foreign" cars and the dealer's own "domestic," he suggests the following:

Any dealer taking in a "foreign" car should first offer it to the dealer for that car. Should the latter not wish to purchase it he would be asked to inspect and report on its condition and give an estimate for reconditioning it.

Then the trader-in would turn the car over to a local auctioneer who would give intending purchasers time to inspect and possibly try out the car, and also show the agent's report on the condition and reconditioning cost. Thus the purchaser would know exactly what he was buying and approximately what it would cost to put it in good condition.

Only one authorized auctioneer preferably would be patronized for a given locality so that he could afford to properly advertise and show the cars for sale.

Advantages of the plan are said to be:

1. Practically immediate disposal of the traded-in "foreign" car.
2. Reconditioning done only by the one best equipped—the regular agent.
3. Public constantly aware of real worth of their second-hand cars.
4. Car owner would be inclined to go to dealer from whom he originally purchased car as agent could afford to allow more than another dealer.
5. Only money tied up would be that for reconditioning

dealer's own line. No "foreign" cars would be reconditioned until bought through the auction and then only by current payment by the new owner.

Taylor Selling Service

AN advertising agency of Detroit, styled the Taylor Selling Service, offers to car dealers a service covering a used car merchandising campaign including copy for advertisements in local newspapers and form letters to send to prospects. This service is sold to one dealer in a community.

Taking Antiques Off the Market

A RATHER drastic and perhaps visionary proposal is to retire all cars over five years old, the manufacturers and dealers to provide capital for junking such used cars, the dealer being compensated by saving the expense of carrying second-hand cars indefinitely and being enabled to carry larger new stock and the manufacturer by the salvage of parts usable for service.

Closely akin was the suggestion that manufacturers take used cars off dealers' hands at salvage value, as is reported practiced by the National Cash Register Co.

Somewhat less radical is the proposal that manufacturers purchase their used cars from dealers on a 90-day acceptance, recondition them and sell them through used-car agents at fixed advertised prices.

The Boston Plan

BOSTON dealers are co-operating enthusiastically in the maintenance of a used-car statistical bureau as a means of eliminating guess work in their trade-in transactions. To compile their data the dealers were furnishing forms to fill out giving the name of the car, year or model and f.o.b. factory prices for the past five years.

The bureau is managed by a committee of five appointed to act for six months which meets weekly to decide questions pertaining to the workings of the bureau. Once a month a meeting is held for all dealers. This committee obtains and distributes lists giving the maximum allowanec for each make and model. These allowance prices are figured by multiplying the list factory price by a per cent depending on the age:

1 Year	58 per cent
2 Years	40 per cent
3 Years	30 per cent
4 Years	24 per cent
5 Years	18 per cent

quoting the nearest multiple of $5 to the answer.

Each week dealers turn in reports of their used car sales showing allowances, cost of repairs, selling price and whether a straight sale or trade. A synopsis of these reports is mailed to all dealers co-operating.

Dealers may cut their new car lists for reasons but advise the bureau when so doing but are not to increase their allowances above the prescribed maximums on trades so that all dealers are on an even basis on trades and no wrong impression is given of second-hand values.

When a customer desires to change a new car within 90 days, the dealer may make the exchange on any basis satisfactory to the customer and himself. Allowances for current models more than 90 days old are figured by multiplying the list by 68 per cent.

Dealers may use their judgment in making allowances on cars over five years old but they must not exceed the five-year allowance.

As regarding the legality of this plan, it is understood that the United States attorney for the District of Massachusetts has given the opinion that there is nothing unlawful in the agreement.

The Saginaw Plan

Members of the Saginaw, Michigan, Automobile Dealers' Assn. have been co-operating for more than six years with a high degree of satisfaction. In handling the used car situation to insure enforcement.

The basis of trading is to allow for a used car what it will bring on resale, minus the cost of conditioning and minus a 20 per cent dealer's commission on the transaction Dealers in different makes of cars fix valuations on the various models of the used cars of these makes over a period of five years backward from date. These figures are on file with all members of the association.

The Saginaw merchants have advertised to the public the truth about depreciation. For example, the first year it is 40 per cent; the second year 20 per cent of the balance; the third year 25 per cent of the balance; the fourth year 20 per cent, and the fifth year 20 per cent.

The Saginaw plan involves: First, a thorough reconditioning of the used car before they are offered for sale; second, 20 per cent profit on the dealer's original investment in a used car; third, trust which members of the dealer community have in each other.

The Oklahoma Plan

This plan provides for weekly meetings of dealers with their bankers in attendance at which business conditions are discussed and reports made on prices for used cars during the previous week. These prices are taken as the basis for showing the market for this used product and proving to the bankers the value of dealers' stocks. In that way they know definitely their credit rating.

The Cincinnati Plan

THE Cincinnati Automobile Dealers' Assn. turned their used car problem over to their bureau of retail sales managers. Under the plan they adopted each dealer worked out schedule or resale values on his own motor cars based on list prices new. These were distributed to the member dealers. From these selling prices is deducted the estimated cost of reconditioning and 10 per cent for handling to arrive at the allowance figures.

There is no fixed penalty and no hard and fast agreement between the dealers.

If the dealer takes a car in to sell for a customer he charges 10 per cent commission for selling it, plus the expense of tires, work, etc.

The depreciation or resale value is taken as a certain percentage of the new list price delivered as follows: First year, 60 per cent; second year, 45 per cent; third year, 36 per cent; fourth year, 29 per cent; fifth year, 22 per cent.

The reader must appreciate that the informative suggestions, views and ideas contained in this article are only by way of inter-change and for the purpose of discussing some of the vexing problems relating to used cars.

A Tire Display That Gets Attention

A garage and accessory man located at a corner of two prominent streets, each having a much used car line, has an unusual method of advertising new and used tires, not only to pedestrians but to occupants of passing motor cars and to passengers on the street cars of the two different lines.

The tires are fitted with white disks on which are painted in large black letters the sizes and the prices. Each tire rests against a neatly made tripod. The display is made on parkway ground between the sidewalk and the curbing of the pavement. The showing is at least 150 ft. long.

MOTOR AGE

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Need of Understanding

THE rapid advance of the bus, the truck and the taxicab as means of travel has brought new problems to the automotive industry that the leaders must give immediate attention. By leaders, we do not mean a few manufacturers, managers of associations or public spokesmen; but the men in each community who have or may assume the leadership in the industry for that community. This man may be a maintenance or vehicle dealer, he may be a distributor or he may be a manufacturer. But there are leaders in any industry wherever that industry has representatives and this is the man that is designated.

MOTOR AGE has said many times that the proper use of the influence of this industry was its greatest power for advancement. This influence is both social and political. The great number of persons allied to the industry and the great wealth represented, make it the greatest power in this country today, if the purpose of the movement be worthy and the question properly presented to those interested.

The latest outcropping of antagonism toward this industry comes from Roseville, Cal., where a railroad union has ordered the boycott of bus lines because they take revenue from the railroads. An attorney from a railroad went to that city and openly asked the merchants there to quit patronizing the inter-city truck lines in favor of the railroads for all freight.

Such a movement is silly, of course, and is so closely akin to the attempt of the farm hands of this country to destroy all of the binders a few years ago that it is apt to cause a smile from those who think and act in terms of automotive transportation and who have the proper vision of the transportation of the future. But despite the apparent humorous side of this protest against what must prevail, there is a serious side and this must, for the present, be considered.

Railroads, especially in the west, have thrived on arrogance. They were built at public expense and existed for years on subsidies. Then came an era of political control of states and cities, until a certain portion of the railroad men actually came to believe that the country owed to them a living. Now there comes a new era and those old school railroad men are unable to understand that they are merely a cog in the industrial development of the country and that to exist, they must perform the function of that cog with a fair degree of efficiency and that in the end, it will be merely the survival of the fittest.

No one in the automotive field has yet predicted that the automobile will supplant the railroad. But we know that for certain work the automotive vehicle is more efficient and more pleasant than the railroad and the railroad men know this as well as automotive men. But some of these railroad men cannot disabuse themselves of the idea that they are the favored few and that all other lines of endeavor should be submerged to provide them with the power that they once held.

Railroad figures have for years shown that short distance hauls were not profitable. As the business has grown and expensive terminals have been necessary to handle the traffic, these short hauls have become more and more a losing venture because of the extent of the terminal work. Now comes the bus and the truck and offers to take this unprofitable business away from the railroads and instead of encouraging this movement, the railroads begin one of their old time fights.

Human masses move slowly and only when the proper education has been advanced. These particular railroad leaders have been asleep to the education that has been going on in recent years. Instead of fighting, the railroads should promote this movement; for transportation is a public service and can only survive as it serves the public. To the person who studies this question impartially, it is surprising that the railroads are not the largest owners of trucks and busses today. The truck and the bus should be used by the railroads to make their transportation efficient. Instead, however, the railroads continue running trains occasionally at a greater expense than they could operate trucks and busses practically constantly, offering to the public efficient service that would build good will instead of criticism. It is amazing how slow the railroads have been to see the profit and advertising in a properly managed store door delivery. Reports current in Chicago are that the younger element of the railroad men see the advantage of a store door delivery system for that city and are anxious for it, but that the enterprise is blocked by one of the older type of executives who occupies a seat with the mighty.

Evidently in their desperation, the railroad execu-

tives are going to join Don Quixote as fighters of windmills.

The course of the automotive industry is clear. There should begin a campaign of education for the people generally, with a special primary campaign for those suffering from railroad astigmatism.

Watch Your Mail

THE Postoffice Department is making a very strong effort to improve the transportation and delivery of mail throughout the country. This effort takes the form of local appeal and every postmaster in the country is asked to do what he can to get his customers to aid wherever they can.

The mails have come to be such an important part of business in this country that the transportation and delivery mean much to every business in the country. It is the sort of business where not all of the improvement can be accomplished from the inside. To build a personnel in the department that will handle the peak load of mail with the dispatch that patrons think is reasonable, would be so expensive that additional revenue would have to be raised by taxes or increased postage. The cheapest and most satisfactory method of handling this problem is to reduce the peak. Only the patrons can do this. If mail is placed in the boxes several times a day instead of at the close of business, it will mean much to the postoffice.

Then, too, circular mail should be so handled that it will not interfere with the regular business mail. The business correspondence of a firm can easily miss a train because it has been buried under an unexpected avalanche of circular mail of that same firm.

Every business firm has some correspondence that especially requires rapid handling. One way to accomplish this, is to learn on just what trains this mail should be carried for best handling and then to see that this mail is so timed that it will catch that train.

The postoffice department or the local postoffice is always willing to co-operate with any firm that wants better mail service. But in this case, as in any others, co-operation means a united effort, not the demand by the patron that the postoffice employes do the impossible in overcoming the carelessness or ignorance of the business firm that asks the service.

Honest Merchandising

PERSONS in official position engaged in investigating the high cost of living, the high cost of merchandising and similar work have had considerable to say about the retailer not adjusting his prices as the manufacturer adjusts his. Of course, merchants resent this publicity which places merchants as a whole in a bad plight before the public. Most of the merchants declare these charges to be false and they endeavor to discredit the investigators.

But are the charges false? In the main perhaps they are, but they certainly are not false as regards the whole retail merchant organization. Only last week a manufacturer spoke rather bitterly of the damage being done to his trade by merchants who are overcharging the public. This particular product was priced, when first placed upon the market during war time, at $2.50 and a large volume of business built up. Some time ago the retail price was lowered to $2 and adjustments made with the jobber price and the jobbers willingly fell in line. But all retailers have not followed. In many sections of the country this article is still being sold as high as $3 and in some cases the retail merchants mutilate the box in which the article is packed to enable them to charge the high price.

Recently spark plugs have been reduced in price in certain lines. But persons who recently have bought spark plugs have been charged the old price by dealers. In some cases the dealers simply say their price has not been reduced, despite the advertising.

Such merchandising is malicious, in that every overcharge if this kind not only lowers public respect for the industry, but it lessens trade generally. The merchant who is so short sighted as to follow this practice will sooner or later be one of those reported on the mortality list.

For instance: A Chicago man recently moved into a new neighborhood. He wanted a spark plug and was overcharged for it. He asked the dealer for the lower price and was lied to. This man will spend quite a bit of money with the automotive dealers in this neighborhood this summer, but it is safe to say he will never again go to this particular store.

Can You Afford To Be Without— *Micrometers and Gages?*

THE days of the hammer and cold chisel variety of mechanic seem to be rapidly approaching the end, and in their stead we find the new days of the micrometer and caliper type of mechanic. And, isn't it logical that a piece of machinery as wonderful and as cleverly wrought as the modern motor car, particularly when we think of the precision fits in the bearings and rapidly revolving parts, should be worked upon with precision tools and with precision methods?

Take the case of a crankshaft which is slightly sprung. Suppose the mechanic does not know it is sprung and he puts it back into the engine and draws up tightly on the main bearing cap bolts. The result is one or more of the bearings will heat and eventually wear the bearing unduly. Now suppose the shop in which this man works is equipped with micrometers, calipers, dial gages, etc. Then the man can place the shaft between lathe centers and with the dial indicator tell exactly how many thousandths of an inch the shaft is sprung.

Then he straightens the shaft in an arbor press or in the lathe and again tests with the dial indicator. When he gets the shaft to run true to half a thonsandth or so, he feels sure that when the shaft goes back into the engine there is little or no danger of the bearings going bad. The job will not come back in a little while to be done over.

Precision measurements will go a long ways towards eliminating complaints and insure work going out of the shop right. It is far more profitable for both shop and customer to have the job done right in the first place.

We do not believe the shop today can get along without a complete line of precision measuring instruments.

RECENTLY the Chamber of Commerce of the United States published a pamphlet on "Perpetual Inventory" that has proven one of the most popular documents this organization has ever sponsored. Those persons interested in this subject would do well to write to the Washington office of the Chamber for a copy of this information. The routine of such a plan is discussed and some forms for keeping such an inventory are offered. The Fabricated production Department of the Chamber is organized to give special information on this subject.

Sales Continue At High Mark

Factory Production for May Certain to Equal April

Orders Now in Hand Promise Activity Into June—Decline Likely to Follow

NEW YORK, May 9.—Skeptics who have thought reports of the tremendous business being done by the automotive industry were exaggerations, have been routed by the preliminary production figures for April, which show that approximately 213,000 cars and trucks were turned out in that month. When the final figures are compiled they are quite likely to shatter the record of 220,000 established in March, 1920. The biggest month in 1921 was August, with 180,781.

Not only was April one of the two biggest months in the history of the industry, but production for the first quarter was the largest on record for the first three months of any year except 1920. It marked a gain of more than 100 per cent over the same period last year.

May is certain to be as large as April and factories in the Detroit district will exert themselves to produce even more heavily. Capacity output will be necessary to fill orders now on hand, and those which still are running into the plant in a flood which shows no sign of abating.

June also promises well, although it does not seem possible that business can continue into the third quarter at the present levels. It is probable there will be the usual mid-summer decline in sales, but nothing like a slump. In fact, it now seems certain that production for the first half of the year will be so heavy that the total for 1922 will be materially larger than for 1921, even if there is a sharp falling off in the sales in the last half, which now seems unlikely.

Although expansion of truck sales has not been as sensational as in the passenger car field, the market is expanding month by month and the output for the year will be much larger than in 1921. There has been a steady gain each month this year and the percentage of increase over the same period last year has been large. The output for April was almost as large as for the entire first quarter. It is significant of the improvement in the farm market that half the commercial vehicles turned out in the first three months of the year were made by three companies producing popular light trucks.

Parts plants have speeded up production to such an extent that the shortage in some lines, which slowed up operations last month in a considerable number of factories assembling vehicles, will be considerably alleviated in May.

Akron reports a boom in tire sales commensurate with that in the passenger car and truck field. Reserve stocks are being depleted to meet demands and production has been expanded. Factories in both Detroit and Akron are having difficulty in finding the skilled labor needed.

Topics to Be Discussed at Service Managers' Meeting

New York, May 10—Twelve discussion topics have been tentatively selected for the N. A. C. C. factory service managers' convention at Detroit on May 16 and 17. The topics are:

Progress of the flat rate system.
Parts and labor practice in connection with warranty.
Parts adjustments.
Interchange of gratis service among dealers.
The retail end of the service problem.
Methods of educating the dealer.
Ideal cooperation between car sales and service departments.
Servicing cars in outlying districts.
Practicability of 24-hour service.
Substitute parts.
Advantages of a fixed service policy.
Reasonable guarantee limit as to time and mileage.

Edward S. Jordan and O. E. Hunt will address the convention. The headquarters will be at the Hotel Statler.

DOBLE STEAM CAR PLANS

San Francisco, May 5—Abner Doble, president of the Doble Steam Motors, this city, announces that his company will produce 30 cars this year. Production will begin Aug. 1. This announcement says that through a Doble invention an electrical control has been obtained which does away with the chief objection to steam cars; that by means of this invention the car can be started from a cold engine in 30 seconds or less by merely turning a switch.

OPPOSED TO CLOSED SHOW

Chicago, May 9—Among Chicago automotive equipment manufacturers who are members of the Automotive Equipment Assn. there has arisen considerable opposition to the decision of the board of directors, made at a recent meeting at New Orleans, to close the association's show to be held here in November to all except members of the association. While they believe that only manufacturers who are members should be allowed to exhibit, many of the manufacturers believe that non-member jobbers should be invited.

NEW LINE OF TRUCKS

Reading, Pa., May 8—The Schwartz Motor Truck Corp. has designed a new line of trucks to supercede the models previously made. The capacities and prices follow: 1 ton, $1685; 2 ton, $3000; 3 ton, $3600; and 5 ton, $4900. The 1½ and 2½ ton models have been discontinued.

April Added 20,000 Workers To the Automotive Industry

Government Employment Service Reports Increased Activity In All Sections

WASHINGTON, May 9—Evidence of increased activity in the automotive industry is given in the report of the industrial survey conducted by the United States Employment Service for the month ending April 30. An increase of 10.4 per cent in employment for March has been noted for the automotive industry, which is classified as "Vehicles for Land Transportation." April records an upward movement with lines broadening out, and according to Federal agents will show increased activity in May. The records show that 20,556 employes were added to the payrolls of the automotive trade during April.

Agents of the Employment Service in Michigan report that the automotive industry is making decided gains. Much over time has been noted for the first time in many months. The continual improvement in the automotive business and general financial conditions has brought about a big demand, and rush orders for wheels increase the employment. In Detroit, part time employment has dropped to less than one per cent and no plants are closed. Factories have absorbed all skilled workmen and the demand for men of that class is greater than the supply. In Lansing, one motor wheel company is working full capacity with night shifts. The automotive parts and specialty shops in Milwaukee expanded operations, and a firm manufacturing bodies has a 10 per cent increase in employment. There is also an increase in the number of operators employed in motor truck and rubber tire factories. The automotive factories in Kenosha, Wisconsin, are working over time. Automotive factories in St. Louis report augmented employment.

In the east, a distinct increase in employment is noted among automotive industries. A motorcycle factory in Springfield has resumed operations and an automobile concern in the same city is now operating on full time. Reports from Connecticut show that business is booming in the automobile accessories trade. Automotive manufacture in New York shows a gradual improvement.

NEW SANFORD TRUCK

Syracuse, N. Y., May 8—The Sanford Motor Truck Co. has added a new 1½-ton truck to its line. This will sell for $2150. The engine has a bore of 3¾ in. and stroke of 5 in. and the tires are 36 x 3½ front, 36 x 5 rear.

Body Shortage Hampers Output

New Lines of Tires at Lower Prices Announced

Action by Goodyear, Seiberling, American and Mohawk Amounts to Reduction

AKRON, O., May 9.—Tire prices, instead of taking their expected and long rumored increase the first of May, have come down. Prices on regular standard make tires have not been reduced, but action tantamount to reductions has been taken by several companies in introducing entirely new lines of cords to sell at from 20 to 25 per cent below the present standard cord tire market lists.

In addition, the new Seiberling company at Barberton has made a revision downward of prices on Seiberling cords and Portage fabric tires, bringing both down to the standard market levels. Heretofore they had sold at above the standard list prices.

New Goodyear Cord

Goodyear is one of the first to announce a new line of cheaper cord tires. The new Goodyear Cross-Rib cords, ready for delivery in June, will sell at about 25 per cent below the present standard cord tire prices and below the prices of Goodyear All-Weather tread cords. Goodyear officials say the new tires are not being developed to compete with standard cord makes, but to compete with jobbers now giving long discounts on standard tires. The new tire will not be a two-cure process casing, but a one-cure instead. It will however according to Goodyear give as many miles per dollar as higher priced cords.

The American Tire & Rubber Co. of Akron has introduced a similar tire to sell on the same price lists as the new Goodyear Cross-Rib cords. This new American-Akron cord will be put into the field in direct competition with all other tire companies marketing a cheaper line of cord casings.

Seiberling's price adjustments bring the cost of the 32 x 4 cords down from 32.90 to $32.40; the 34 x 4½ from $44.50 to $43.90; and the 35 x 5 from $55.40 to $54.75. On the Seiberling line of Portage fabric tires, the price reductions are from $10.90 to $9.50 on the 30 x 3 clincher; $12 to $10.50 on the 30 x 3½ clincher; $25.45 to $22.90 on the 32 x 4 straightside; and from $27.25 to $24.60 on the 34 x 4 straightside.

The Mohawk Rubber Co., whose tires have been selling above the standard lists announces a new Little Chief fabric tire to sell at the standard market prices.

RECENT PRICE REDUCTIONS

Hartford, Wis., May 6—Reduced prices are announced by the Kissel Motor Car Co. The list follows:

	Old Price	New Price
2, 4 and 7 passenger phaeton	$2675	$2385
Coupe	3125	2975
Sedan	3235	3075

The company has brought out a new 5-passenger touring car which sells at $1885 as compared with $2675 for the old model.

Freeport, Ill., May 9—The Stephens Motor Works announces reduction in the prices of the Salient Six models. The new list follows:

	Old Price	New Price
Roadster	$1675	$1575
4-passenger phaeton	1745	1595
6-passenger phaeton	1745	1625
Coupe	2650	2450
Sedan	2650	2550

There is an enclosed touring model selling for $2,000.

Detroit, May 9—The King Motor Car Co. announces reduction in the prices of its models. The new list follows:

	Old Price	New Price
Phaeton car and foursome	$2125	$1795
Roadster	2140	1795
Coupe	3125	2400
Sedan	3235	2550

Canton, O., May 6—The Holmes Automobile Co. has reduced the prices of its various models. The list follows:

	Old Price	New Price
7 passenger phaeton	$2950	$2500
4 passenger phaeton	2950	2500
4 passenger coupe	3850	3300
7 passenger sedan	4150	3600

New York, May 6—The following price revisions have been announced by the Paige-Detroit, Chalmers and Brewster companies:

	Old price	New price
Paige, 6-66		
4-passenger	$2245	$2495
3-passenger	2495	2245
Chalmers (117 WB)		
Coupe	2095	1995
Sedan	2395	2295
Brewster		
4-passenger	6000	5000
7-passenger	6000	5000
Sedan	9200	7000

Indianapolis, May 5—Reductions ranging from $515 to $765 have been made by the Nordyke & Marmon Co. on the Marmon car. This is the second cut in prices the company has made this year, the first being effective Jan. 3. The schedule is as follows:

	Price Old	Price New
4-passenger Roadster	$3,700	$3,185
4-passenger Phaeton	3,700	3,185
7-passenger Phaeton	3,700	3,185
7-passenger Sedan	5,150	4,385
4-passenger Coupe	4,700	3,985

Strong Demand for Enclosed Cars Partly Responsible

Lack of Skilled Labor Also Holds Back Manufacturers in Detroit District

DETROIT, May 9.—The body situation continues to be the most serious factor in the general production program of automobile factories in the Detroit district. Though the situation is apparently eased, it is only because it is too early in the month to begin straining for certain production figures. Many factories are still somewhat fagged from the April effort.

Aggravating the body situation is a condition of labor unrest which is largely due to the shortage of skilled body help, and which has resulted already in a strike in the finishing department of one of the leading body makers of the city. With prices of cars at existing low marks, there is little possibility of increases in wages. If wages go up, car prices are certain to follow.

Manufacturers who have been intending to locate their own body plants in the Detroit district will probably find it necessary to bring in entirely new corps of skilled workers. Every effort is being made to develop workers from the present unskilled ranks, and many men are being brought in from other cities, but there is need still under existing rush conditions, for hundreds of men.

Manufacturers of cars using custom-made bodies have been unable to get bodies in anything like the quantity required. Lincoln has been sadly handicapped in this respect, a condition which is almost certain to result in the establishment by that company of a body plant. Cadillac, making its own bodies, has had no difficulty, nor has Packard, which practically controls the output of its two body makers.

The demand for enclosed body cars is a distinctive feature of the 1922 buying. There is undoubtedly a definite desire on the part of the car using public, especially those who are not buying for the first time and who can only afford to own one car, to have that one car an enclosed vehicle. Price reduction and the development of the coach type vehicle have brought the enclosed car within the price range of many owners for the first time this year, and this is regarded as largely responsible for the increased business.

Demand for the enclosed cars varies largely according to the line. In some factories it is running higher than fifty per cent of production and in others it is much lower. It is noteworthy, however, that these factories which have striven to develop distinctiveness in their enclosed vehicles are the ones that are

(Continued on next page.)

Government Tests Show How Tire Mileage Is Lost

Bureau of Standards Will Issue Brochure Giving Results of Experiments

WASHINGTON, May 5—Tests intended to show how to get more mileage out of tires are now being made by the Bureau of Standards, Department of Commerce, it was announced today giving the first preliminary report on the work already done by the Bureau.

The proper design and the correct inflation pressure of tires is of major importance if the motorist is to get the greatest mileage, the report states. Tests made show that various parts of the tire contribute to the absorption of power, of varying degrees. From 80 to 85 per cent of the loss in power, it was found, is due to the carcass of the tire, 10 to 15 per cent due to the tread and about 5 per cent due to the tube.

These results are based upon tests which were made on a special type dynamometer in the rubber laboratory of the Bureau. The dynamometer consists essentially of a motor for driving a standard automobile wheel and tire, a pulley which bears against the latter, and a generator driven by the pulley. By suitable weighing arrangements the difference between power input and output may be easily measured. The difference, represents the loss in the tire.

It is possible to test upon this machine any make of tire under varying conditions of speed, and inflation pressure. The present announcement of the tests, it was stated, is only preliminary. A brochure on the tests is being prepared and will be ready for the automotive industry in six or eight weeks.

U. & J. IN NEW HOME

Chicago, May 6—The U. & J. Sales Co., manufacturers of the U. & J. carbureter, whose factory here was destroyed by fire, recently, has purchased a three-story factory building and expects to be in full production by June 1. The new factory has 45,000 square feet of floor space and the company expects to add another story.

The company intends to manufacture several new devices pertaining to ignition, lubrication and transmission, according to C. A. Kemper, sales manager. Orders received in the last 15 days exceed those of the previous 30 days, Kemper said, and he expects this year's business of the company to equal or exceed that of the previous best year.

USED CARS SELL WELL

Chicago, May 8—Used cars are selling well in Chicago. The used car show which closed last week resulted in the sale of more than 200 cars on the Coliseum floor and probably as many more in the sales rooms of the various exhibitors, according to officials of the Chicago Automobile Trade Assn. The condition of all the cars was certified to by the association and some of them brought exceptionally good prices. Thirty-seven dealers exhibited.

The sale of new cars continues good, but a number of dealers report that recent price reductions in some lines have tended to slow up deliveries in other lines, prospective purchases deciding to wait awhile.

Salesmen Give Selling Talks in Contest

COLUMBIA, S. C., May 6—A feature of the recent meeting of the Columbia Automotive Trades Assn. was a salesmanship contest in which a number of automobile salesmen made their best sales talk before an audience of 150 people. One person in the audience was presumably in the market for a car and the salesmanship talks were addressed to him. At the conclusion, members of the audience voted by ballot for the salesman they thought made the best talk and the winner will be announced at the next meeting.

DE PALMA UNDER FIRE

San Francisco, Cal., May 6—The Greater San Francisco Speedway Assn., owner of the San Carlos Bowl, and of which Fred Morton is president, has filed charges against Ralph de Palma, veteran automobile racer, and Frederick J. Wagner, widely known as a race starter, with the contest board of the American Automobile Assn., of which William Schimpf, of New York, is chairman. The charges allege that Wagner tried to dissuade racers from entering the Easter Sunday races in the San Carlos Speedway, and that de Palma aided Wagner in this effort. The reason for Wagner's action is alleged to have been the failure of the Greater San Francisco Speedway Assn. to name him as starter for these races. Charges also were filed at the same time against Eddie Miller because of his failure to start after he had entered his name on the lists.

BETHLEHEM MOTORS REORGANIZED

New York, May 8—The Bethlehem Motors Corp. which recently was purchased at receivers sale by A. T. Murray and Howard B. Hall, former officers, has been reorganized by the election of Murray as chairman of the board; Hall as president; E. H. Leland as vice-president and treasurer; W. H. Rogers, secretary and assistant treasurer.

FINANCE COMPANIES TO MEET

Indianapolis, May 6—The first annual meeting of the National Association of Finance Companies, including many automobile financing concerns, will be held here June 7, at the Columbia Club.

Studebaker Begins Expansion Program to Take Five Years

First Step is $3,000,000 Building to Increase Output of 6's from 200 to 300 a Day

SOUTH BEND, IND., May 8—The Studebaker Corp. already has begun the expansion of its plant for which the directors have authorized the expenditure of $3,000,000. The new structures will include an enclosed body building plant and car storage and shipping buildings. They will permit an increase in the production of light 6's from 200 to 300 a day. The building program which has been mapped out will require the eventual expenditure of $15,000,000 and will cover five years.

The first of the buildings to be erected will be the storage plants, paralleling the administration building. One of these will be 624 feet by 76 feet, four stories high, built of reinforced concrete. The other will be a one story structure 624 feet by 77 feet. The closed body plants which will be built upon the present site of the old harness factory of the original Studebaker enterprise, will be four stories high. One of them will be 145 feet by 170 feet and the other 370 ft. by 145 feet. These buildings will be completed by October if possible and will be ready for operation not later than Jan. 1. The company also will build a large new power plant. It is expected that 2,500 more men will be added to the payroll by Jan. 1.

MOON BUILDING 42 CARS

St. Louis, May 6—The Moon Motor Car Co. is building 42 to 45 cars a day and expects to increase the number to 50 by May 15. Orders in hand provide for capacity production until July 1, according to officials of the company. Nine new dealer contracts have been signed.

BODY SHORTAGE HAMPERS OUTPUT

(*Continued from preceding page.*)

getting this business. The increase in the enclosed car business has had a somewhat retarding effect on the compilation of new production records because of the greater care required in the building.

Overtime work continues unabated in most of the parts and equipment plants and deliveries of material have reached a volume in keeping with the production requirements of the makers. Foundries by employment of constant shifts have brought the castings situation well within bounds and deliveries are now coming through on most of the small parts and fittings which for a time threatened hold-ups.

The amazing part of the whole situation, as one manufacturer expressed it, is the way the tremendous inventories which the parts makers have been theoretically burdened with, disappeared in the face of releases from the car makers.

Murphy Wins Cotati Race In World's Record Time

Driving Duesenberg Special He Makes 100 Miles at Rate of 114.93 Miles an Hour

SANTA, ROSA, Cal., May 7—Jimmy Murphy won the 100-mile Cotati speedway event in world record time today, two minutes under the former mark, when he came home ahead of a fast field in 52:1.23, an average of 114.93 miles per hour. Frank Elliott was second and Harry Hartz third.

The old mark for 100 miles on a speedway was 54:5.8, made by Eddie Hearne on the same speedway Aug. 14, 1921.

Pietro Bordino won the fifty mile event in 26:13.3, an average speed of 114.2 miles per hour, with Harry Hartz second and Jimmy Murphy third.

The complete entry list of drivers and the cars they drove follows:

Driver	Car
Eddie Hearne	Disteel-Duesenberg
Tommy Milton	Durant Special
Pietro Bordino	Fiat Special
Ralph de Palma	Duesenberg Special
Joe Thomas	Duesenberg Special
Roscoe Sarles	Duesenberg Special
Eddie Miller	Duesenberg Special
Jimmie Murphy	Duesenberg Special
Frank Elliott	Leach Special
Art Klein	Frontenac Special
Peter de Paolo	Frontenac Special
Harry Hartz	Duesenberg Special
J. Wonderlich	Duesenberg Special

KELLEY TIRE TO BE SOLD

New Haven, Conn., May 5—Plant and business of the Kelley Tire & Rubber Co. at West Haven is to be sold to the Armstrong Tire Co. of Garfield, N. J., according to orders of Judge J. W. Banks in superior court here. Financial consideration involved is $225,000 in cash and $50,000 in preferred stock of a new corporation to be organized for operation of the West Haven factory. The court acted on recommendation of the receivers for the Kelley Tire & Rubber Co., who considered the Armstrong offer better than two other proposals which had been received.

LOS ANGELES DEALERS ELECT

Los Angeles, May 5—At the annual meeting of the Motor Car Dealers' Assn. the following officers were elected: Paul G. Hoffman (Studebaker), president; Harry Lord (Velie and Jordan), vice-president; Benj. Finch (Ford), secretary; Ralph Hamlin (Franklin), treasurer; L. V. Starr, F. S. Albertson and P. H. Greer, directors.

CHICAGO EXPECTS GOOD SUMMER

Chicago, May 8—Chicago's motor row is a busy place right now and the busy ones are of the opinion that although sales will drop off somewhat when the Spring demand has been take care of, an unusual summer is ahead. Used cars form a big part of the sales while the production reports from the factories show that new cars are also sharing in the business.

W. H. Farrington, recently appointed manager of the Maxwell-Chalmers Co., says that sales on these cars has been far ahead of expectations and the Chevrolet Co. has scarcely enough salesmen to meet the customers who come to the sales rooms. It is believed by dealers exhibiting at the Used Car Show that, while sales there were not extraordinarily large, enough names were gathered to keep the sales forces busy for some time.

GENERAL MOTORS STOCKHOLDERS

New York, May 5—Notwithstanding the suspension of dividends on the common stock of the General Motors Corp., the number of common stockholders of record on April 7 was 50,591 as compared with 48,348 at the close of the first quarter of 1922 and 44,640 at the close of the last quarter of 1921. Strangely enough there was a slight shrinkage in the number of holders in other classes upon which no dividends have been passed. The total of stockholders at the close of the second quarter was 72,665 against 70,504 at the close of the first quarter.

TRUCK AND TRACTOR CHANGES

New York, May 6—Price revisions have been announced by the manufacturers on the following tractors:

	Old Price	New Price
Automotive	$1,785	$1,250
Wallis	995	1,195

Canastoto, N. Y., May 5—Watson Products Corp. announces an increase in the prices of its two models as follows:

	Old Price	New Price
1-ton	$1,685	$1,865
3½-ton	3,825	4,250

A. A. A. CONVENTION

St. Louis, May 6—For the first time in 20 years, American Automobile Assn. is to hold its annual meeting away from Washington, D. C., its headquarters. St. Louis has been selected for the meeting May 19-20. The date has been advanced from May 22 and 23 out of the courtesy to the American Medical Assn., which is to hold its annual convention in St. Louis the week of May 22.

GASOLINE TAX VOTED DOWN

Boston, May 10—Automobile organizations in Massachusetts fighting legislation here won a sweeping victory Wednesday when the lower branch of the legislature killed the proposed one cent a gallon tax on gasoline and the 100 per cent increase on truck fees.

GRAY TO BUILD 200 IN MAY

Detroit, May 8—Gray Motor Corp. will build about 200 cars in May. Distribution of these will provide a number for each of its distributors, so that the new car may be given public demonstration over a wide territory. Heavy production will start in June.

Marmon's Reduction Sends Production Up; Many Orders In

Force to Be Increased; Other Indiana Factories Stepping Up

INDIANAPOLIS, May 8—Nordyke and Marmon Co.'s reduction of touring cars to $3185 has brought a lot of business to the factory in the few days since it was announced. Shipments of approximately 500 are expected to be made this month which is larger than any month of 1921 with the exception of June.

The plant is now employing 2650 men and additions to the force are being made steadily. Not more than 600 of this force are said to be engaged in the manufacture of milling machinery, although this force as well as that of the automobile division is to be increased.

Other local and near-by Indiana factories are using the classified columns of local newspapers in the endeavor to build up working forces. The Maxwell plant of Newcastle as well as Studebaker of South Bend are advertising for skilled craftsmen in local papers daily.

Stutz Motor Car Company is also increasing its factory force, and finding it increasingly difficult to pick up high class skilled craftsmen. The business at the plant has steadily increased during the last 40 days, and by May 15 an enlarged production schedule is going into effect.

H. C. S. has also added to its force somewhat and has a larger output than at this time last month. Sales and orders seem to be gaining steadily and metting the expectations of the officials and director of sales, Frank Willis.

NEW FILM ON "SHOP PROFITS"

Chicago, May 5—Following a meeting of the merchandising committee of the Automotive Equipment Assn. here it was announced by Ray Sherman, director of merchandising, that a second merchandising film will be produced to follow the campaign with the "Ask 'Em to Buy" film. The title of the new film probably will be "Shop Profits."

WOOD WHEEL ASSOCIATION

Detroit, May 6—The Automotive Wood Wheel Manufacturers Assn. has been reorganized. It dissolved as an independent association when it became affiliated as a group with the Motor and Accessory Manufacturers Assn. When that organization abandoned its group activities, the wheel manufacturers decided to become associated as they were before entering the M. A. M. A.

MEMBERSHIP NEARS 100

Chicago, May 9—At the meeting here last week of the Association of Automotive Equipment Manufacturers eight new applications for membership were received. Membership is now about 100.

Grand Prix Medal Won by American Driver

THIS illustration shows both sides of the Grand Prix medal won at Le Mans, France, last July by Jimmy Murphy in a Duesenberg. It has just reached the United States. Murphy covered the distance of 321.78 miles in 4 hr., 7 min., 11 sec., an average speed of 78.12 m.p.h. This was the first time that the Grand Prix was won by an American driver.

National Offers Creditors Associated Motors Securities

Indianapolis, May 6—The National Motor Car & Vehicle Corp. has sent telegrams to its creditors asking their consent to a plan for the absorption of its assets by the Associated Motor Industries, Inc. Creditors are asked to accept 10 per cent in cash, 25 per cent in one year notes, 15 per cent in bonds and 50 per cent in preferred stock of Associated Motor Industries.

The telegram states that Associated Motor Industries has ample working capital with $15,000,000 in current assets and only $1,500,000 in current liabilities. It's fixed assets are estimated at $10,000,000 which have been used as security for $6,000,000 in 10 year bonds. The National company states that banks representing three-fifths of the unsecured credit claims have assented to this plan.

TRADE ASSOCIATION BILL

Washington, May 5—Legislation presented to the senate by Senator Edge of New Jersey designed to define the activities of trade associations, is not to be allowed to sleep in the files of the judiciary committee, according to the Senator. His resolution has developed a great deal of support among trade organizations, and letters are being received by members of the senate and house approving it.

SHORTENS ASSEMBLING TIME

Detroit, May 6—F. H. Low, superintendent of branches of Ford Motor Co., speaking at a convention of the Society of Industrial Engineers here, said that company was working on an ideal lay-out for future branches, and that while present branches were from one to twelve stories high, all future branches would be flat as a pancake.

By adoption of a conveyor a mile and a quarter long, the Ford company, he said, had shortened the number of labor hours for assembling engines from six in 1913 to two hours and ten minutes. A conveyor installed last year has allowed the company to do away with 150 trucks previously used to move castings and forgings.

FIVE-DAY WEEK POSTPONED

Detroit, May 8—The Ford Motor Co. announces that the five-day week in its plants will not become effective until late in the summer. It is hoped that by that time the Highland Park plant will be equipped to permit quantity production in five days a week. Rush of work in the last few weeks has caused the company to adhere to the six-day week. The production is now about 4,000 cars a day.

ASSOCIATION TO REMAIN INTACT

Rock Island, Ill., May 6—Tri City Auto Trades Assn. membership has decided not to divide the organization into three separate bodies for each of the three cities—Davenport, Rock Island and Moline. It will establish branches of the motor trades into bureaus to provide greater service and benefit to the various firms represented in the membership, however. Battery, tire and repair departments, general accessories, exclusive car dealers and truck agencies will be probable bureau divisions.

CHEMICAL CONTRACTS SIGNED

Detroit, May 8.—Contracts have been signed between the Chemical Research Syndicate, Ltd., headed by F. F. Beall, vice-president of the Gray Motors Corp. and the Barnsdall Corp. of New York, by which the latter company will become the sole licensee in the United States and Mexico of the hydrogenation process perfected by Dr. A. S. Ramage by which low grade fuel oils may be converted into motor spirit.

Big Appropriations for Road Building Approved by House

$140,000,000 Is Figure Submitted In Bill to Congress for Work

WASHINGTON, May 8—Appropriations amounting to $140,000,000 for road building, by the Federal government were approved last week when the House passed the so-called Dunn bill. The measure provides for $65,000,000 during the next fiscal year and $75,000,000 for the following fiscal year. It contains a penalty clause to insure continuous highway development.

The program as adopted by the House covers a two year period and limits the expenditures to $12,500 per mile for the first year and $10,000 per mile thereafter. This bill does not interfere with the money already in the hands of the Department of Agriculture amounting to $180,000,000, which has already been allotted on the basis of $20,000 a mile.

According to a statement of Congressman Cable the money that will be appropriated in this road bill for the next fiscal year would equal a tax of not to exceed 62 cents for each person in the United States. He pointed out that this expenditure was necessary for better and quicker transportation of farm products and developments of highways.

MARCH FOREIGN SHIPMENTS

Washington, May 8—The international trade revival brought about large shipments of American automotive vehicles and equipment during March. This is strikingly shown by the export totals for that month as announced by the Bureau of Foreign and Domestic Commerce. The shipments totaled 4,471 passenger cars, valued at $3,381,430; 590 motor trucks valued at $554,292, and parts, not including engines and tires, to a total of $3,596,539. The tire shipments for the month were $2,201,349.

TRACTOR DEMONSTRATION

Omaha, Neb., May 8.—More than 100 men from different organizations of the Ford Motor Co., throughout Nebraska, attended a tractor demonstration here last week. The Ford Motor Co. has established about 100 experimental farms in Nebraska, Iowa and South Dakota. These farms are run under the supervision of Fordson tractor dealers.

VELIE TO USE RADIO

Moline, Ill., May 6.—The Velie Motors Corp. is arranging to use the radiophone to advertise its cars in the show rooms of all its dealers. The company will erect a broadcasting station at the factory and will send out announcements and reports of the Velie's achievements, which may be picked up by receiving instruments in the dealers' salesrooms.

Government Presents Figures For Lincoln Motor Co. Case

Charges Are Made That Reimbursement of the Entire Plant Was Effected

WASHINGTON, May 5—The Government's claim for $9,188,581 against the Lincoln Motors Co. will be based on 13 counts. Copies of a memorandum prepared by the War Department and turned over to the Department of Justice charge that the Lincoln company made a total net profit of $5,265,000, after reimbursing the Lincoln Motors Co. for its entire plant. According to the memorandum, the Lincoln Motors made 700 per cent profit on its war contracts.

Following are the 13 charges made by the War Department:

That the Company collected a total of $45,065,693.19 for its work, which was sufficient to reimburse it for the entire cost of its plant and leave a net profit of $5,265,000.

That the profits of the company on its war contracts amounted to 700 per cent of the money invested by the company.

That in 1918 Henry and Wilfred Leland each received salaries of $100,000; William T. Nash, secretary and treasurer, was paid $27,000, and that Leroy T. Williams, received an annual salary of $27,000.

That this was an increase of $50,000 for each of the two Lelands and $15,000 for Nash and Williams.

That the company was unlawfully paid an unearned profit of $1,000,000 when its contract was cancelled, although the government had retained the right to cancel the contracts under certain conditions.

That the Lincoln company erected the finest automobile factory in the United States at Government expense, without the Government being consulted or advised with in any manner as to the character, or cost of the buildings. The buildings which the government paid for included a $500,000 office building and a $170,000 restaurant, it is charged by the War Department.

That between January, 1920, and November, 1921, the company lost assets worth $20,000,000 and was placed in the hands of a receiver.

That the government reimbursed the company for plant and production costs without an audit being made to establish the accuracy of the claim.

That although the original contract provided that the company was to be amortized at the rate of 40 per cent upon the actual cost of its plant, the contract was later modified to provide that the amortization should be at the rate of 55 per cent.

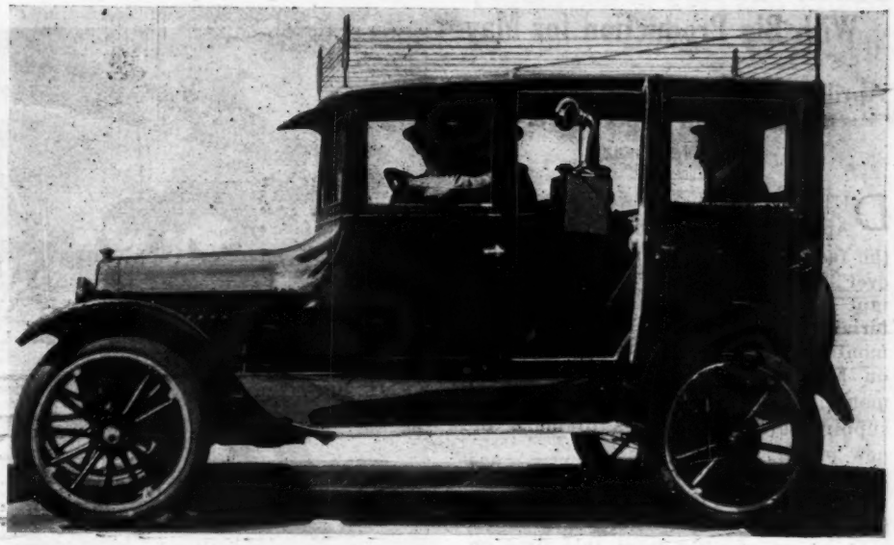
That the Government paid amortization amounting to $363,534.60 on fifty-two acres of land bought by the company at a total cost of $680,972, in spite of the fact that the land was worth approximately $1,000,000. Of the 52 acres only 18 were actually used by the company for manufacturing purposes.

That amortization amounting to $257,000 was paid on a separate plant located on Holden avenue in Detroit, which was owned by the Lelands before they began work for the Government.

That as the government had completed and paid a handsome profit on all but 28 per cent of the work the government had contracted for, the company was only entitled to amortization upon 28 per cent of the cost of its plant, instead upon the total cost of $8,700,000.

That the contracts with the government which provided for a profit of $625 on each completed Liberty motor were unlawfully changed so that the company received a flat price of $4,000 per motor or a net profit of $1,276 each.

Sedan Equipped for Radio Receiving



DETROIT, May 8—Satisfactory use of a radio receiving instrument in an automobile without the use of a "ground" has been demonstrated by the Chevrolet Motor Co. With a car equipped with a radio receiver the tourist or picnicker could enjoy concerts and receive news and market reports wherever he happened to stop, within a reasonable distance of a broadcasting station, the company states. The instrument installed in the Chevrolet may be readily removed to the home, office or other place for use. The company predicts that hereafter many automobiles will be equipped with radio instruments.

HAYES COMPANY REFINANCED

Galva, Ill., May 5—Control of the Hayes Pump & Planter Co., refinancing plans of which were successfully completed a few days ago, has been returned to the directors, newly elected. Officers of the company are now: E. L. Yocum, president; R. W. Hayes, vice president and secretary; A. L. Hayes, vice president; F. H. Hand, treasurer and general manager. W. L. Jacobs, of Chicago, president of the Mitchell Motors Co., Racine, Wis., is also a member of the directorate.

NEW AIR-COOLED ENGINE

Bridgeport, Conn., May 4—The Liberty Manufacturing Co., of Stratford, announces that it has successfully negotiated with a western concern for the manufacture of its air-cooled motor, to be used in an automobile now under construction. According to President Frank Kurtieski of the Stratford concern, a favorable report of the motor has been received by him and an order amounting to $2,000,000 awaits his concern as soon as it is able to negotiate the financial means necessary to inaugurate operations on full time.

"If we receive the support that we expect," he said, "we will be operating at our full capacity within six months' time. Perhaps we will decide to manufacture a complete automobile, using our air-cooled motor for our own purposes."

DETROIT TO HOLD FALL SHOW

Detroit, May 8—The Detroit Automobile Dealers' Assn. will hold an enclosed car show in the early fall months as a means toward getting a flying start on fall and winter business. The show will be limited only to members of the association and will be held in a centrally located exhibition hall yet to be selected. H. H. Shuart, manager of the association, will be director of the show.

1134 FRANKLINS IN APRIL

Syracuse, N. Y., May 6—The Franklin Automobile Co. reports shipment of 1134 cars in April, making last month the second largest month in the history of the company.

Detroit Factories Continue With Big Production for May

April Handicapped by Shortage of Materials and Labor; Overtime Necessary

DETROIT, May 8—Two causes kept April from being the biggest month the factories in the Detroit district have ever known. The first and most important of these was the shortage of material and the second was the 30 day month. May with its extra day, orders on hand covering a forced production month, and an improved situation in the supply markets, promises to make the new mark.

Factories held up in April are already getting parts in increased volume and improvement in this direction promises to hold up steadily from this time on. Shortages have not been confined to any particular part, though the body situation and castings presented the most serious obstacles. Aside from these, every factory seemed to run short on something different, such small fittings as bolts and nuts even having a part.

Fisher Body Co. Ran Into Inventory Period at End of April

To aggravate the body situation for the moment, the Fisher Body Co. ran into its inventory period at the end of April and was down over the week end including Monday. Several car factories dependent on Fisher for their body supply were compelled to close final assembly departments, though work in other departments was kept up. This delay at the start of the month will require overtime work at once to catch-up with ordinary schedules.

Ford Motor Co. will fulfill its schedule of 101,164 cars for April and will build 120,000 in May. Tractor production will continue at 400 daily.

Dodge continues on a schedule of 650 cars daily.

Maxwell with a production of 250 to 300 daily in April is aiming at the latter figure as the desired production mark for May.

In the medium priced field, **Studebaker,** operating at 440 cars a day in April, will continue this rate, which represents forced capacity, during May.

Hudson-Essex with a production figure of approximately 250 daily in April, will increase this in May.

Hupp production approximating 160 cars daily in April, will be increased in May.

Oldsmobile production reached approximately 120 cars daily in April, and will be increased in May.

Oakland continues its production of over 100 cars daily.

Paige-Jewett shipments approximated 2700 in April, 1100 being Jewett. May schedules call for 3800 production, evenly divided in both products.

Reo speed-wagon output approximated 65 daily, with car production close to the 100 mark.

Columbia will build 1000 light sixes in May and about 500 of the larger model.

Earl will build 60 a day in May, an increase from 40 in April.

Rickenbacker completes April schedule of about 500 and will increase this to about 800 in May.

Durant schedules 80 daily in May, increasing from 60 in April.

Saxon will build about 300 cars in May, April production being held low because of factory moving.

Liberty, April production approximated 25 daily and will be increased in May.

In the higher priced field the new **Packard** single-six shows a wide popularity, an output of 1500 being scheduled for May with increases to 2000 as rapidly as can be made. Twin-six production will approximate 500 and trucks a similar figure.

Cadillac production is now running higher than 100 daily.

Lincoln, with delays in its body shipments owing to the custom nature of the work, had an output of about 500 in April which will be increased to about 800 for May.

Handley-Knight will build about 200 cars in May.

Wills Sainte Claire is doubling its factory force and will build about 60 cars daily in May.

Roamer reports heavy business in April which will be largely increased in May.

Speedy Propellor-Driven Motorcycle

ZION CITY, Ill., May 8—A motorcycle driven by an airplane propeller, which attains a speed of 70 miles an hour, has been invented by William Croft of this city. It uses a two-cylinder motorcycle engine and 48-in. propellers.

YELLOW CAB CO. EXPANDING

Chicago, May 6—The Yellow Cab Manufacturing Co., manufacturer of Yellow taxicabs, this week began the construction of an additional story to its two-story office building adjoining its factory in this city, and within the next two weeks it is planned to start work on a factory addition. It has not yet been decided whether the factory addition will be one or two units.

The large growth of the company's sales in the last few months makes expansion necessary. Officials state that orders now in hand provide for capacity operation into August. The output is now 16 cabs a day and an effort is being made to increase this to 25 a day. The sales force is being increased, five road salesmen having been added recently. It is planned to divide the United States into ten sales districts. The company's orders are coming from all the large cities, where taxicab transportation, the officials say, is increasing at an extraordinary rate.

OHIO ASSOCIATION LOCALS

Columbus, O., May 8—Since the first of the year the Ohio Automotive Trade Assn. has assisted in the organization of local associations at Zanesville, Medina, Marion, Sidney and other places. The State association is trying to help solve the used car problem for dealers.

ACCESSORY SHOW

St. Louis, May 8—The Motor Accessory Trade Assn. of St. Louis will hold a show at the First Regiment Armory the week of May 22-27, under the management of J. H. Gennison.

Many Plans Suggested for Illinois Automotive Trade Assn.

Car Registration, Publicity, Bulletin and Other Departments May be Formed

PEORIA, Ill., May 8—At a recent meeting of the Board of Directors of the Illinois Automotive Trade Assn., Manager F. C. Zillman outlined a comprehensive plan for the operation of local associations in co-operation with the state association. He suggested the following departments and services:

Car Registration Bureau, for the county in which the local association is located; address plates of all car owners in the territory, subdivided according to make of car, to be purchased by the local association, this service to be open to members in good standing for circularizing at a cost covering actual operating expense of the department.

Employment Bureau, where usual record of applicants may be kept for benefit of members who want help of any kind such as salesmen, mechanics and office help. This department will work both ways in aiding employers and applicants. In connection with the employment bureau would be an employes' record department where a record would be kept of all employes of members.

Bulletin Service, relating to chattels and liens. Bulletins to be issued periodically giving name of people against whom chattel mortgages and liens have been recorded at the County Recorder's Office.

Better Business Bureau, operated for the stoppage of all fake advertising schemes and providing the truth in advertising. The soundness of any proposition would be investigated by this bureau at the instigation of any member.

Interior Department, where grievance committees promptly investigate grievances among the members and every effort is made to adjust difficulties and arrive at an amicable understanding.

Publicity Bureau, where publicity of a general character showing soundness and enormity of industry would emanate from.

Automotive Exhibit Department, under whose auspices all automotive shows and truck tours would be staged.

Credit Information Bureau, operated for confidential information of members only.

General Information Bureau.

PLAN NEWARK SPEEDWAY

Newark, N. J., May 8—Negotiations have been opened which may result in the construction at Port Newark of one of the largest and fastest speedways in the world. Jack Prince of Los Angeles, builder of the speedways in that city, Indianapolis and St. Louis, has tentatively selected a site 3,600 by 2,000 feet and has taken preliminary steps for its purchase. He plans to build a mile-and-a-half track and to erect two stands, each a quarter of a mile long, accommodating 100,000 spectators. Parking space would be provided for 20,000 automobiles.

Urges Method of Numbering Engines to Prevent Theft

New York, May 6—Upon the recommendation of the insurance committee of the National Automobile Chamber of Commerce, the directors have urged the Society of Automotive Engineers to further its effort in developing a method of numbering engines and frames so that thieves will find it difficult to change the numbers without detection. Insurance underwriters have held open for some time an offer of 7½ per cent reduction in theft rates on cars with engines numbered in this way, 7½ per cent for frames and 20 per cent if both engines and frames bear approved number. The underwriters conference now has voted to renew this offer until Jan. 1, 1923, but if something is not developed and agreed upon by that time the offer will be withdrawn. All suggestions made thus far have been proved unsatisfactory by the Underwriters Laboratories which has succeeded in changing the numbers in a way that defies detection.

OTTAWA TO HAVE RACES

Ottawa, Ont., May 5—The directors of the Central Canada Exhibition here, have decided upon a novel innovation for the exhibition in September. Automobile races will be featured on the Friday and Saturday afternoons. Plenty of support is promised from many American professional racers, amateurs not being allowed to race, so that accidents will be reduced or avoided as far as possible.

INFRINGEMENT SUIT DISMISSED

Baltimore, Md., May 8—Judge Rose has handed down an opinion in the United States court dismissing the suit of August R. Gross against Joseph Frank for alleged infringement of a patent for a parking lamp for automobiles. Gross conducts a business as the General Machine & Specialty Company and Frank as the A. R. J. Mfg. Co. Both are located in Baltimore.

BIG REVENUE IN GASOLINE

Harrisburg, Pa., May 8—The state of Pennsylvania has realized $1,057,767 from gasoline taxes during the first six months of enforcement of the new tax law, according to figures made public by the auditor general's office. Half of the sum will go to the counties.

75 ENROLLED IN PEORIA ASSN.

Peoria, Ill., May 6—Following an intensive membership drive, conducted by Secretary F. C. Zillman, 75 motor vehicle accessory dealers, and garage proprietors of Peoria, have been enrolled in the Peoria Automobile and Accessory Dealers' Assn.

Production of Cars and Trucks for April Estimated at 213,000

Figure Closely Approaches Record for Automotive Industry; 35 Per Cent Ahead of 1921

NEW YORK, May 6—Production of passenger cars and trucks in April by all manufacturers is estimated at 213,000. This closely approaches a record for the automotive industry and when the final figures are compiled it may be found that last month set a new mark. It is certain that it has been exceeded only once or twice. Carload shipments last month, which are estimated at 30,200 established a new level. The closest approach to it was in March 1920 when the figures were 29,236. April production ran 35 per cent ahead of April 1921 and 24 per cent above March of this year when the total was 173,342 of which 19,422 were trucks. The factory shipment figures for the first three months of 1920, 1921 and 1922 follow:

Carloads

	1920	1921	1922
January	20,057	6,485	15,241
February	25,505	9,986	19,600
March	29,236	16,287	17,380
April	17,147	20,187	30,200

Driveaways

	1920	1921	1922
January	29,283	3,185	7,397
February	43,719	7,507	9,950
March	57,273	9,939	15,800
April	64,634	14,197	22,500

Boat

	1920	1921	1922
January	.....	93	154
February	.....	99	169
March	.....	75	264
April	.....	1,619	3,200

HUDSON ESSEX SHORTAGE

Detroit, May 5—Hudson-Essex production for the first quarter of 1922 was *182 per cent greater than for the same* period last year, a factory statement declares. In spite of this heavy production there is a shortage of cars of both makes throughout the country and demands of almost everyone of the company's 64 distributors have been curtailed.

TO BROADEN ASSOCIATION

Elgin, Ill., May 8—It has been decided to extend the scope of the membership of the new Elgin Automotive Trade Assn. so as to include dealers of all towns adjacent to Elgin. This will add 15 to the roster, bringing the total up to 60. A membership committee was appointed to canvass the territory and sign new firms. William Barnard was chosen business manager and will have charge of finances and secretarial duties.

CHANGES NAME

Houston, Texas, May 5—Louis Leon Mary, inventor of an automobile shock absorber sold under the name of Lomar, has had his name legally changed to L. L. Lomar, making it the same as the name under which his invention is sold.

Mitchell Show Proves Success Despite Farmers' Lack of Cash

Seven Dealers' Exhibit Draws 6,000 Paid Admissions and 83 Dealers

MITCHELL, S. Dak., May 5—The Mitchell Automotive Assn. has just held its first annual show with results that are considered remarkable in view of the poor business conditions which have prevailed for many months throughout this strictly agricultural section.

The show was held in the new $250,000 Corn Palace Building, on April 20, 21 and 22. Mitchell has a population of about 10,000 and three years ago there were 25 automobile dealers in the town. Now there are fewer than half that number and only seven exhibited at the show. But in the three days of the show there were 6,000 paid admissions and 83 dealers from elsewhere attended. Sioux City and Sioux Falls distributors of lines not represented in Mitchell brought exhibits. Capt. Eddie Rickenbacker of the Rickenbacker company, attended the show two days.

In all there were 22 makes of automobiles shown and there were 36 exhibitors of tires and accessories.

OREGON " A. A. A." RACES

Portland, Ore., May 6—Oregon will have its first sanctioned "A. A. A." races in several seasons this spring, according to arrangements concluded in Portland with Frank Watkins, Oregon representative on the A. A. A. race board. Gus Duray and J. Eddie Hickey, two prominent dirt track drivers, will manage the event, which is being sponsored by a group of automobile men and sportsmen of Portland. The races will be held at Salem on June 3. Salem is 50 miles from Portland on a paved road and possesses the only track in the vicinity of Portland where fast driving is considered safe.

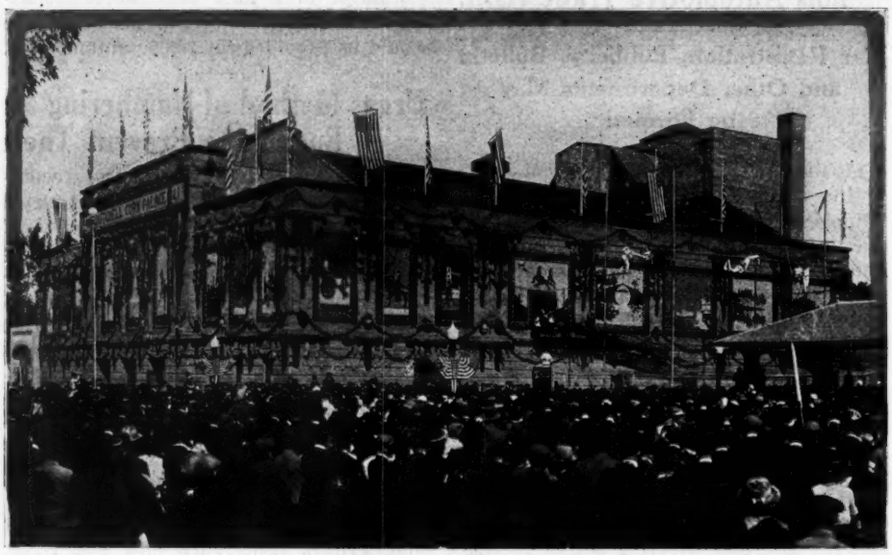
The Salem races will be for both professional dirt track racers and for dealers' stock cars. Several races of both kinds will be arranged, ranging from 10 to 25 miles in length around the one-mile track.

WILLYS-OVERLAND BONDS

Toledo, May 8—Preferred stockholders of the Willys-Overland Co. at a special meeting ratified without a dissenting vote the proposal made by the directors for funding of the bank department through issuance of $17,500,000 of 7 per cent first mortgage bonds to mature Dec. 1, 1923. The bonds will be taken up by the banks which had extended the company's loans for several months and will have the effect of pledging the fixed assets where formerly only current assets were involved as security for the loans.

The production of the plant here has passed the 400 a day mark and the total for the second quarter of the year will surpass 30,000 cars, which is more than double the production during the same period a year ago. More than 8000 men are now at work in the plant here and more are being added as rapidly as materials can be secured to boost production schedules.

Mitchell (S. D.) Corn Palace, Scene of Successful Automobile Show



ONEIDA RESUMES PRODUCTION

Green Bay, Wis., May 9—The Oneida Motor Truck Co. of Green Bay, Wis., which has been virtually idle for some time, has experienced a renewal of demand and is getting back to promotion on a fairly satisfactory scale. L. W. Melcher, formerly factory manager of the LaCrosse Tractor Co., and later with the Oshkosh Tractor Co., who has been connected with the tractor department of the Allis-Chalmers Mfg. Co., Milwaukee, for several months, has joined the Oneida company as general manager. Lafayette Markle, who served as vice-president and general manager for about two years, recently returned to Chicago and is again engaged in business as a distributor and dealer.

SHOW BUILDING FOR TEXAS

Dallas, Tex., May 6—Cooperative underwriting 17 per cent of the cost of an automobile show building to be erected by the Dallas fair board, probably will be undertaken by a group of Dallas automobile merchants. Eight have already pledged their support and it is the intention to add several others to the list.

BEARDSTOWN FLOOD RELIEF

Peoria, Ill., May 6—The Board of Directors of the Illinois Automotive Trade Assn. has instructed the secretary, F. C. Zillman, to visit Beardstown, where floods recently did great damage, and determine what the State asssciation can do to aid Beardstown automobile dealers whose business suffers from the flood.

Full Service From Cars If They Buy When You Ask 'Em

Chicago, May 6—"Full service from your car" is the motto adopted by the merchandising department of the Automotive Equipment Assn., to support the "Ask 'Em to Buy" campaign.

"Ever since this work began," states Ray W. Sherman, merchandising director, "there has been a need for some sales argument that could be shot at the public in order to stimulate sales. Some folks have wanted to put the 'Ask 'Em to Buy' slogans on the dealers' windows, but that, of course, wouldn't do because the car owner is the buyer and not the asker.

"So here is the thought that should underlie the dealer's 'Ask 'Em to Buy' work. He 'Asks 'Em to Buy' so full service will be obtained from the car."

SUES TO PROTECT AUTOCAR NAME

Philadelphia, May 8—The Autocar Co., Ardmore, Pa., has filed a bill in United States District Court, seeking an injunction against the Peters Autocar Co., of Bethlehem, Pa., and DeVellier & Co., enjoining them from making use of the name Autocar. The bill of complaint sets forth the original name was registered as a trademark in the Patent Office in 1903 and asks that the companies mentioned be made to pay damages for the use of the name.

DETROIT DEALERS ELECT

Detroit, May 9—Harry R. Graham was elected president of the Detroit Automobile' Dealers Assn. at the first meeting of the new board of directors last week. R. H. Williams was elected vice president; Walter J. Judd, secretary, and C. W. Hathaway, treasurer. H. H. Stuart was renamed manager of the association, beginning his seventh year in that position.

IN THE RETAIL FIELD

S. R. Thomas Automobile Co., Little Rock, Ark., has acquired the show rooms of the Olier Overland Co.

World Tire Co., of Chicago, has opened a branch store in Huntsville, Ala.

W. D. MacMillan, Jr., Wilmington, N. C., is opening a Packard agency.

C. A. Robinson, Dwight, Ill., has opened a new motor car sales agency.

C. C. Coddington, Inc., has received its second trainload of Buicks this month. One hundred and twenty-eight cars were in the latest shipment.

Kalamazoo Auto Exchange, Kalamazoo, Mich., has completed its new garage and will soon move into it.

E. J. Beale Motor Co. has succeeded Foreman Automobile Co. as Ford dealers in Murray, Ky.

Standard Motor Co. is announced as the new Haynes dealer for Columbia, S. C.

Star Motor Co., of California, has completed its plans of organization and will soon enter the field as the Golden States' representative of the new low-priced car.

Madison-Kipp Corp., of Madison, Wis., announces a reduction in the retail price of Oil-Kipps. The Oil-Kipps, formerly priced at $1.25, now sell for 95 cents. The company announces that a new policy makes room for a number of high-grade distributors having field organizations covering the wholesale and retail automotive trade.

Packard Motor Car Co has closed its Kalamazoo Auto Sales Co.

Wisconsin Auto Sales Co., Fond du Lac, Wis., has been appointed Cleveland dealer in Fond du Lac county. It also is Packard dealer.

Dargie & Co., Iron River, Wis., will build an addition to double the size of its garage and repair shop, now having 6,500 sq. ft.

L. F. Schoelkopf, Madison, Wis., district distributor of the Ford, will engage extensively in the wholesale automotive equipment business and is about to erect a 2-story fireproof building, 40 by 100 ft., apart from the Ford garage, one of the largest in Wisconsin.

North Side Garage, Hartford, Wis., has been purchased from Albert Lotsch and Douglas Ports by Edwin H. Starr, who for 11 years was connected with the Kissel Motor Car Co. at the main plant in Hartford.

Stanley Garage, at Stanley, Wis., owned by George Ulander, has been leased to Victor LaVine and C. J. Harrison, formerly of Hibbing, Minn., who have secured a Ford franchise for Stanley and vicinity.

Frank X. Dietz, LaCrosse, Wis., has been appointed Franklin dealer and district distributor in LaCrosse, Vernon, Monroe and Crawford counties, Wis., and Houston county, Minn.

Nash Service Co., Neenah, Wis., incorporated for $10,000, takes over the service department of the Tri-City Nash Co., which recently moved into its new salesrooms. Edward Abendschein is president; Walter Abendschein, vice-president, and Arthur McCloud, secretary-treasurer.

Jerome Terwilliger, Clinton, Wis., will erect a 2-story fireproof garage and repairshop, 74 x 135 ft., estimated to cost $38,000 equipped.

Wingra Park Garage Co., Madison, Wis., is erecting a new sales and service building, 114 by 120 ft., 1-story and part basement.

Krisor Bros., Kenosha, Wis., will build a $20,000 garage and repairshop, 60 by 109 ft., part 2-story and basement.

G. W. Glover, Madison, Wis., has plans for a new garage and service building estimated to cost $17,500.

Rilbicki Garage, Kenosha, Wis., will invest about $25,000 in enlarging its garage and shop and installing a new salesroom front.

John W. Spear, Mason City, Ill., has opened a modern garage, of fireproof construction which will be known as the "Midway." He will conduct a general storage and repair business and also handle a line if accessories.

Tuscola, Ill., Motor Vehicle Tire Co., under the management of C. O. Randall, has commenced operations. There are fifteen employes and fifty tires can be produced daily. As the demand increases, the force of employes will be increased. Orders on file, ensure a year's steady operation.

Leslie Chase, Dwight, Ill., has opened a garage and will specialize in repair and storage business. For the past year, he has been employed as instructor in motor mechanics at the school for soldiers conducted by the government.

Iowa Tire Co. has opened a shop in Muscatine, Iowa, in the building formerly occupied by the Volger vulcanizing shop. J. A. Knight will be manager.

Dail-Overland Co. here has just received a shipment of 250 cars for distribution in North Carolina. The cars were 60 per cent Overland and 40 per cent Willys-Knight.

LaFayette Minnesota Co. has been incorporated in Minneapolis at $100,000. G. T. Simpson is president, O. W. Bowen is vice-president and R. B. Rheberg secretary and treasurer.

George Peak, Peoria, Ill., has opened a sales agency and will be distributor for the Haynes and Columbia cars. He will also continue to handle Haynes trucks from a branch agency.

Stewart-Warner Speedometer Corp. has opened an authorized sales and service station in St. Paul. Factory trained experts will be in charge.

Northwestern Oldsmobile Co. has opened a salesroom in St. Paul. E. M. Klohn, eight years in the motor business in St. Paul, is manager.

Edwards & Crist Co., motorcycle retail agency, has been appointed Chicago distributor for the Auburn cars.

Claude Rouch and C. V. Swanson, proprietors of the Auto Top Works in Belvidere, have opened the Triangle Auto Top Works, Rockford, Ill.

Get-Gas Service Stations, Inc., gasoline and automobile lubricating oil distributors, with headquarters at Springfield, Ill., and branches in many Illinois cities, opened a St. Louis branch. **Hanson J. Marks** has been appointed St. Louis division manager.

Missouri Tire Co., Inc., a new corporation, has been appointed distributor for the Oldfield tires and tubes for St. Louis and adjacent territory. The officers of the company are B. J. Fitzsimmons, president and J. W. Sumner, secretary and treasurer. The company is also distributor for the Dayton tire.

Rue Motor Co., Bloomington, Ill., will hereafter be in charge of H. D. Rue. Since the retirement of Thayer Morrow on Jan. 1, last, to take the Dodge Bros. car distribution, C. T. Prall, of Chicago, has been manager. Prall has now retired to engage in Ford car distribution by himself and has opened a sales agency at Highland Park, a suburb of Chicago. Rue has gone to Bloomington, purchased a residence there and will make that city his headquarters, although still retaining his interests in his Chicago company.

J. E. Downing, Decatur, Ill., has opened a sales agency and will distribute the Oldsmobile in the Macon county territory. As soon as possible, he will erect a modern building, which will rank with the finest in that city.

Pfingsten Motor Co. has been organized at Burlington, Ill., and will distribute motor vehicles and accessories. The promoters are Herman E. Pfingsten, Fred Pfingsten, and John A. Lenschow. The capital stock has been fixed at $3,000.

Jewell-Bassett-Jewell Co., distributor for the Studebaker, announces the opening of a new stadium branch, with G. A. Archer, Jr., formerly with the D. & D. Battery Service Co., as manager.

Owl Garage and Larson & Lundberg, dealers, report sales of 15 cars in the last week. The models ranged from Ford runabouts to Reo, Chevrolet, Dodge, Elgin and Grant cars. Three carloads of Chevrolets are due and a carload of Reo machines is enroute.

TACOMA RACES JULY 4

Tacoma, Wash., May 5—At least 15 national and international speed pilots are expected to enter the eleventh speedway classic to be held here July 4 on the Lakeview track. Prizes aggregating $25,000 and points toward national rating will be awarded. The A. A. A. has granted the Tacoma Speedway a sanction for the race on the national holiday.

Wilbur D'Alene, who has been out of the game for a number of years, will return to the field this year and is the first pilot to signify his intentions of driving at Tacoma.

Biggest Single Spurt In Tire Industry at Akron

Manufacturers Cannot Meet Demand; Call for 1000 Skilled Workmen

AKRON, O., May 6—The rubber tire industry in Akron has reached the point where it is practically impossible for manufacturers to meet the current demand for tires without drawing upon their finished goods inventories.

The biggest single spurt the tire industry has taken since the beginning of the depression period early in 1920, has caused a call to be issued by Akron manufacturers for 1000 experienced tire builders. These men now are being taken on by various tire companies in addition to 1500 men employed by the Goodyear Tire & Rubber Company, since April 13, and 1000 more absorbed by Firestone, Goodrich, Miller, General and the smaller tire factories.

Manufacturers here attribute the sudden and unexpected spurt in tire sales, to the fact that both automobile manufacturers and tire dealers have been too cautious and conservative in ordering supplies for the spring trade. The manner in which orders are piling into Akron indicates that there are not enough tires on dealers' shelves to meet the current consumer demand, and indicates also that motor car manufacturers have exhausted their supplies of original equipment tires, having plainly underestimated the demand for motor cars this spring.

Tire manufacturers who had built up a finished goods inventory of about 60 days' supply of tires, admit that they will find it necessary to tap these reserve supplies until such time as enough men can be employed to build up production commensurate with current demand. They fully expect the present spurt to continue without abatement until at least Aug. 1, and in re-employing tire builders are informing them that the work will be for at least three months and possibly longer.

Tire production in Akron has jumped up to more than 80,000 a day, which is more than 80 per cent of the peak production obtained in the first five months of 1920.

Goodyear has a production ticket calling for over 25,000 tires a day. Firestone has a production of 24,000 casings daily.

WANT TO BUY PARENTI CO.

Buffalo, April 29—Announcement was made here that a stockholders' protective committee was being organized to raise sufficient capital to buy the assets of the Parenti Motor Corp., fixed at $400,000, and to obtain sufficient working capital to go on with the production of cars. Plans are expected to be completed within two weeks.

BUSINESS NOTES

Kokomo Automotive Mfg. Co., Kokomo, Ind., is the new name of the Automotive Accessories, Inc.

Madison (Wis.) Automotive Dealers' Assn. has decided not to hold a show this year.

Snyder Automobile Co., Columbus, O., has let contracts for the erection of a new sales room and maintenance station.

Belknap Hardware & Mfg. Co., has awarded the contract for the construction of its $1,000,000 building to the Struck Construction Co., Louisville, Ky.

International Steel Products Co., Hartford, Wis., has been reorganized into a new corporation under the name of International Stamping Co.

Ninigret Mill, Westerly, R. I., manufacturers of fabrics for Fisk tires has added a night shift.

St. Paul Union Bus Co., Minneapolis, has been organized to effect a consolidation of terminal and office. It is planned to build a terminal building.

Sampson Electrical Co., Chicago, has been appointed official station and sales representative for the Rayfield carbureter.

Burgess Battery Co., Madison, Wis., has been granted a charter in Illinois. Its application states that of its capitalization of $480,000, the sum of $159,504 is to be employed in the business in Illinois. The principal place of business in that state is at Chicago, and Duncan Keith is agent and manager.

Nash Motors Co., Kenosha, Wis., has purchased for immediate installation a third electrically heated furnace of the rotary type and of 150 k. w. capacity, manufactured by the George J. Hagan Co., Pittsburgh.

Jorgenson Mfg. Co., Waupaca, Wis., manufacturer of priming devices and other gas engine and automotive specialties, brass castings, etc., has filed a voluntary petition in bankuptcy. Schedules list liabilities at $44,802 and assets at $120,215. The petition sets forth that lack of working capital has made it impossible to operate the plant satisfactorily for about two months, making a receivership advisable. Of the liabilities, $31,407 are unsecured. Taxes due amount to $4,730. The principal items of assets are: Merchandise, $10,000; real estate, $50,000; machinery, $60,000; bank deposits, $215. Six judgments amounting to about $12,000 have been entered against the corporation recently. C. J. Miller is president, and S. K. Wood, secretary.

Otis C. Friend, Racine, Wis., widely known in the automotive industry, has filed a voluntary petition in bankruptcy, as an individual, in the federal court at Milwaukee. He gives his liabilities as $288,364, and his assets at $50,000. Friend formerly was president of the Mitchell Motor Car Co., and later became head of the United Motors Accessories Corp., more recently taking over the Olympian Motors Co. of Pontiac, Mich., which became the Friend Motors Corp. Of the liabilities, $238,597 is secured. The largest debt is a conditional one of $150,000. Friend states he endorsed a note in that sum given to the Gotham National Bank of New York. The name of the payor is not given in the petition. The debt is secured by bonds of the Olympian Corp. The assets of $50,000 consist of a loan made to the Friend Motors Corp. of Pontiac.

Blackhawk Service Station, Davenport, Iowa, with a capital of $10,000, has been granted incorporation papers to erect and maintain stations in Davenport. John C. Mohl is president and William A. Jackson, secretary.

Studebaker Auto Livery, Minneapolis, has added a Drive it Yourself department with 20 1922 cars for rental. The company teaches renters how to drive and has made reasonable rates for the departure.

Liberty Motor Bus Co., Cleveland, Ohio, has been incorporated, with a capital of $10,000, to operate motor busses in and around Cleveland. Incorporators are Gust Gorlas, William I. Taylor, Helen M. Kinsler, Howard M. Jones and James Chakeres.

C. M. Zeman Garage, Davenport, Ia., has let contract for the construction of a $25,000 building.

Automatic Lock Co., has been incorporated in Minneapolis, at $200,000. Charles H. Wilkinson is president, Nora P. Hoehn is vice-president, Otto J. Hoehn is secretary and treasurer. The incorporators are from Grenora, N. D.

Battery Plate Manufacturing Co. has been incorporated in Minneapolis, at $50,000. W. A. Hudson is president, L. M. Powell is vice-president, L. R. Edwards is secretary-treasurer.

Lemar Mfg. Co., Middletown, Ohio, has been incorporated with a capital of $100,000, to manufacture shock absorbers and other accessories. Incorporators are: Charles W. Shartle, C. W. Shartle, Jr., L. L. Lomar, L. Shartle and L. M. Geran.

Robinson Battery Service Co., Minneapolis, has been incorporated at $100,000, for manufacturing of batteries and battery maintenance by Frank Robinson, J. J. Kennedy, Guy Pugh and C. G. Schultz.

Brunsin Accessory Co., Greenville, N. C., has been chartered with a capital stock of $50,000 authorized and $7,500 subscribed by W. H. Dail, Jr., E. G. Flannigan and R. R. Brunson.

Peoples Garage, Inc., Union S. C., has been chartered with a capital stock of $5,000. C. E. Edwards is president and E. J. Arthur secretary and treasurer.

Fairchild Motor Car Co., New Orleans, distributors of the Dodge Brothers car, is using a touring car equipped with radio receiving outfit for advertising purposes. The car stops at various busy street corners in the evening and uses a Magna Vox to make the concerts audible to the large crowds which soon gather.

Springfield Coach Works, Springfield, Mass., has doubled its force employed in making automobile bodies, and is turning out many custom bodies for the Rolls-Royce and other makes. With associate concern, the Springfield Harness Works, it is rushing production of Hendee sidecars.

New England Battery Co. has opened an establishment in Springfield, Mass., for the manufacture, repairing and re-charging of batteries for automotive and radio use.

Charles S. Burkhardt Co., Buffalo, has asked city council for permission to erect a seven-story, 1,200 car garage. All floors would be used for live storage. Later, the company states, it plans to buy additional property and erect buildings to provide room for 4,000 cars. The property on which the firm has an option is in the heart of the business district.

Columbus Storage Battery Co., Columbus, Ohio, is the name of a new concern, which will manufacture storage batteries. Harry Moore, who has been in the automobile and battery business for 20 years, is the manager.

Hartford, Conn., Automobile Dealers' Assn., is trying to find out why gasoline is five cents a gallon higher in Hartford than in Meriden or New Haven, only short distances away.

S. F. Bowser & Co., Inc., Ft. Wayne, Ind., annual meeting of stockholders, was held at the company offices here recently, and the following officers were elected: President, S. B. Bechtel; vice-presidents, A. A. Bowser, H. M. Bowser, D. A. Corey, W. G. Zhart and J. William Peterson; secretary-treasurer, H. J. Grosvenor. All of these officers were re-elected.

Badger Auto Top Co., Chicago, has been incorporated to deal in and repair automobile tops.

Camp Grant Repair Shop suffered a loss of some $50,000 recently, when fire destroyed 28 trucks and a number of motorcycles.

Friend Motor Car Co., Pontiac, Mich., was bid in for $150,000 by the Gotham National Bank, New York, at a mortgage foreclosure sale here yesterday. The bank was the only bidder at the sale which was ordered by Federal Judge Tuttle. The property recently was appraised at $450,000. The building formerly was occupied by the Olympian Motors Co., and prior to that time was used to manufacture the Carter car.

TO DISCUSS HIGHWAY TRANSPORT

New York, May 9—Tentative approval has been given by the Chamber of Commerce of the United States to a group meeting for the discussion of highway transport at its annual convention in Washington in May. A. J. Brosseau, president of Mack Trucks, Inc., has been named chairman of the division.

Studebaker Corp. Shows Increase in Profits 100 Per Cent

Increase in Production of Cars Is 143 Per Cent; Sales 96 Per Cent

NEW YORK, May 6—The Studebaker Corp. for the first quarter of the year reports net profits of $4,069,848 compared with $2,110,577 in the corresponding quarter of last year. After payment of $171,500 on its preferred stock and $1,050,000 on common, a surplus remained of $2,848,348 for the quarter in contrast to $889,077 in 1921. The directors have declared the regular quarterly dividend of 1¾ per cent on common and preferred stock payable June 1 to stock of record May 10.

In his report, A. R. Erskine, president of the corporation, states that production for the quarter was 26,665 cars, an increase of 143 per cent over the corresponding period of 1921 and that net sales were 22,801 cars, an increase of 96 per cent. Reporting on conditions, he says:

"Inventories March 31, amounting to $23,392,698, include over $7,000,000 surplus production of cars in the first quarter for spring business. These cars, plus 30,000, scheduled for the second quarter production will make the current quarter a record breaker. We are unable to supply the demand despite the fact that our plants are in record production of better than 10,000 cars a month. Firmly believing in the permanency of our growth, the directors have authorized the expenditure of about $3,000,000 for machinery, a new closed body plant, our storage and shipping building and a new electric power plant at South Bend."

These facilities when completed will permit increased production of light sixes from 200 to 300 cars a day.

LOSS OF DEALERS IN TEXAS

Fort Worth, Tex., May 6—The loss of small town dealers throughout North Texas is proving a handicap to automobile distributors. Proposals that the building up of a new network of dealers was a job for the distributors and big dealers has not met with much favor here. Back of the proposal is the suggestion that this shall be done by the distributor and dealer indorsing the paper and helping to carry the burden of the financial needs of the small dealers. Automobile men here seem to be determined not to follow this suggestion.

MOLINE PLOW CO. ORGANIZED

Richmond, Va., May 9—The Moline Plow Co., Inc., has been incorporated under the laws of Virginia as a reorganization of the Illinois company. It has an authorized capital of $20,000,000 in preferred and 200,000 shares of common.

CONCERNING MEN YOU KNOW

Frank C. Mattern has been appointed manager of the Dort Motor Car Co., New York, which is moving its offices and sales department to new quarters.

C. G. Welsh and E. W. Pringle have formed the Exall Battery Co., at Dallas, Tex.

J. D. Isaacs, service manager of the Ford Motor Co., of Canada, Ltd., has resigned to become president and general manager of Middlesex Motors, Ltd., of London, Ont. He was one of the early employees of the Ford Canadian company, joining that organization sixteen years ago.

L. D. Maxson has resigned as purchasing agent of the Durant Motor Co., of Michigan. The resignation is due to the fact that purchasing for all Durant enterprises will be concentrated in New York and Maxson preferred to maintain his home in Lansing.

John L. Hibbard has been elected president and general manager of the Maxwell and Chalmers subsidiary companies in Windsor, Ont., where the Canadian products of the companies are manufactured. He will assume complete charge of all operations at once.

Capt. "Eddie" Rickenbacker of the Rickenbacker company, led a parade of 50 Rickenbacker automobiles through the streets of Chicago last week, marking the first shipment of Rickenbacker automobiles by boat to the L. Markle Co., Chicago distributors.

F. W. Fuhr, formerly with the Chevrolet branch in Pittsburgh, has been appointed manager of the Chevrolet Motor Co., St. Louis. He succeeds **Fred N. Coats,** who has been appointed general manager and vice-president of the Chevrolet Motor Co., of California, at Oakland, Cal.

Joe Boyer, Detroit sportsman and automobile speedway driver, has joined the distributing organization of the Liberty Motor Car Co., as a member of the Miller-Judd Co., handling Liberty in Detroit and Michigan territory.

J. J. Gibson, manager of the supply sales department of the Westinghouse Electric and Manufacturing Co., has been appointed assistant to vice-president **H. D. Shute. A. A. Brown** becomes manager of syndicate operations, and **J. S. Tritle,** former manager of the St. Louis office of the company, becomes manager of the merchandising sales department. **T. J. Pace** becomes manager of the supply sales department; **C. E. Allen,** manager of the St. Louis office; **George Baily,** supervisor of distributing agents; **M. C. Morrow,** assistant to the manager of the merchandising sales department, and **J. J. Dorney** assistant to the manager of the merchandising department.

J. E. Gardner, of the J. I. Case Threshing Machine Co., Minneapolis, has been re-elected president of the Northwest Tractor Trade Assn. Other officers are: vice-president, **H. W. Brown,** of the Huber Manufacturing Co., and **W. R. Biggs,** of the Avery Co., treasurer; **C. Z. Wagner,** of the Wagner-Langemo Co.; secretary, **L. C. Pryor,** Farm Implement and Tractor Journal.

John Cruse, for twelve years one of the company of the Cruse-Crawford Mfg. Co., is now connected with the Birmingham Auto Body Co. He organized the Cruse-Crawford Co. 12 years ago.

Pierre S. Du Pont headed a committee of officers of the General Motors Co., when it inspected the Fisher Body plant at Cleveland, recently.

Roy R. and H. M. Fisher, Davenport, Iowa, who have conducted the Davenport Y. M. C. A. automotive school, have secured option on the property, which has approximate value of $25,000. Their option expires in two weeks, and if the purchase is consummated the Fishers expect to install new equipment and enlarge the school, which was opened two years ago. Its classes are running full time with wide variety of courses.

N. P. Hanson, with the Packard agency in Chicago, has taken up his duties as manager of the Davenport, Iowa, branch. He succeeds Jack Meade, who resigned to retire to his former home in Philadelphia, where he will engage in business.

F. C. Chandler, president of the Chandler Motor Car Co., and **Edward S. Jordan,** president of the Jordan Motor Car Co., have been elected members of the board of directors of the Cleveland Chamber of Commerce.

William A. James has been appointed advertising manager of the Hudson Motor Car Co. and Essex Motors, succeeding **George W. Cushing,** who resigned recently to enter the advertising agency business in Buffalo. James has been connected with Hudson-Essex for a number of years, being first in the sales and technical service departments. He entered the advertising department a year ago. Previous to his factory connection he served as an automobile salesman in the retail field for a number of years.

Hervert Laev, for 18 months with the Milwaukee Oakland Co., Milwaukee, has resigned to become connected with the Edwards Motor Car Co., distributor of the Dodge in Wisconsin.

George O. Smith, for six years identified with the advertising of Sears, Roebuck & Co., has resigned to join the advertising department of The Better Tires Co., Chicago mail order Jobbers of Tires and Accessories.

HISTORIC GROUND FOR RACES

Pottstown, Pa., May 5—The Pottstown Automobile Dealers' Assn. has leased the Mill Park Farm, together with the historic hotel where John Potts, founder of the town, entertained General Washington and Lafayette, Baron Steuben and other officers during the revolutionary war, for automobile motorcycle and light harness races. On the property is the five-mile track where the Pottstown and the Tri-County Fair Assn. held their light harness and running races for many years. The grandstand and bleachers will be extended and improvements made in the hotel. Among the events planned is a 100-mile championship automobile race, with national race drivers competing.

NEW MEMBERS OF A. E. A.

Chicago, May 7—At a recent meeting of the Automotive Equipment Assn. the following were elected to membership:

Jobbers

Bigelow & Dowse Co., Boston, Mass.
Farrell Auto Supply Co., Brooklyn, N. Y.
Hub Cycle Co., Boston, Mass.
Mills-Morris Co., Memphis, Tenn.
J. H. & F. A. Sills Co., Columbus, Ohio.

Manufacturers

Carr Fastener Co., Boston, 39, Mass.
Champion Blower & Forge Co., Lancaster, Pa.
French Battery & Carbon Co., Madison, Wis.
Gilfillan Bros., Inc., Los Angeles, Cal.
North East Electric Co., Rochester, N. Y.
Smith & Hemenway Co., 261 Broadway, N. Y.
Thomas Auto Top Co., Muncie, Ind.
Turner Brass Works, Sycamore, Ill.
Wright Mfg. Co., Lisbon, Ohio.
National Carbon Co., Long Island City, N. Y.

ESSENKAY TO REORGANIZE

Chicago, May 6—The Essenkay Products Co., manufacturers of the synthetic rubber filler for automobile tires, has filled a voluntary bankruptcy petition at the federal court here. Liabilities were listed at $152,143.53 and the assets at $65,439. Company is capitalized at $500,000. F. D. Mayer, president of the company, said that bankruptcy was the result of business slump two years ago and that the company will be re-organized and continue to manufacture the Essenkay products.

Cleveland Tractor Co. to Make Car Designed by F. M. Zeder

Additional Capital of $5,000,000 to Be Added for the New Venture

NEW YORK, May 8—The Cleveland Tractor Co. will be reorganized as the Allyne-Zeder Motors Co. to manufacture and market the new six-cylinder car which is being designed by F. M. Zeder, formerly chief engineer of the Willys Corp. and the Studebaker Corp. The reorganization will be brought about by adding approximately $5,000,000 of new capital to the present assets of the Cleveland Tractor Co., resulting in a corporation with a capital of $10,000,000 of preferred stock and 200,000 shares of no par common stock. It is not expected that there will be a public offering of the new stock, as the entire issue will be taken by private subscription.

A new corporation subsidiary of the Allyne-Zeder Motors Co. will be organized under the name of the Cleveland Tractor Co. and will continue the marketing of Cletracs as well as a new one-ton truck embodying advanced details in design engineered by Rollin H. White. The reorganization plan is practically ready for submission to the stockholders of the Cleveland Tractor Co. and the cooperation of several of the larger stockholders practically assures its adoption. E. E. Allyne, whose name is included in that of the new company, is a director of the Aluminum Manufacturers, Inc.

DEALERS AT YOSEMITE

San Francisco, Cal., May 6—The second annual San Francisco motor car dealers' run to the Yosemite National Park, will be held under the auspices of the San Francisco Call, a daily newspaper, on May 20-22. The first run was staged last August, with 23 dealers participating. Entries this year so far number 34, and it is believed the total will be about 40 when the run starts.

CAMPING OUTFIT FOR TOURISTS

Chicago, Ill., May 6—Among the many displays which attracted wide attention at the Used Car show here last week, was the "Tourist-Bungaloo," invented and manufactured by John Rietschel of Chicago. It is a tent with table, beds, windows and has no long poles, everything being collapsible, permitting the outfit to be folded into a box which fits on the running board.

LOWER TRUCK PRICES

Pontiac, Mich., May 5—Another price reduction effective May 1, has been made by the General Motors Truck Co. The prices follow:

	Old Price	New Price
1 ton	$1495	$1295
2 ton	2775	2375
3½ ton	3950	3600
5 ton	4350	3950

The Readers' Clearing House

Questions & Answers on Dealers' Problems

Written Agreement Not Necessary to Collect Commissions Due Salesmen

I AM a subscriber to Motor Age and wish to consult you on the following:

A was working for a garage as an electrical and battery man, having full charge of the shop at a consideration of $40 per week and a 5 per cent commission on all new battery sales. Garage was sold to B and he made an agreement with A to continue to work for him at the same figure. Also, A could use his own car as a service car to collect batteries and do other necessary errands for the business and B would make no charge for its storage.

B paid the commission on the sale of three batteries and now commissions have accumulated to the amount of $154.74. He has never refused paying them but mentioned several months ago that he was a little short of funds at that time and if A could get along without his wages for a week or two until he could get some money he had due him, it would help him greatly. The wages now amount to about $150. A has requested his check twice and each time has received $10. B says he hasn't received his money yet.

It has come to A through another party, that B has stated he does not intend to pay the commission to A as he is receiving all he is worth at $40 a week. In event of trouble in adjusting this, where there is no written contract and no witness to agreement where B has never mentioned a reduction in salary, discontinuance of commissions or a dissatisfaction of A's work, what chance has A in collecting the full amount? In event that B should go into bankruptcy, which is liable to happen, what chance has A to collect his salary and wages in full before a diversion is made to other creditors?

Will be very grateful for any information you may be in a position to give me relative to this case as I expect to have to force collection.—C. E. Baird, Perry, Ia.

In all ordinary contracts an oral agreement is just as effective, creating the same duties and obligations as a written contract. They are often put in writing for the sole purpose of preventing subsequent dispute as to their terms. If you can prove that you had the same contract with B as you did with the former garage owner, then you should be able to prove what the contract provided for. Surely you have enough facts to establish this contract. An acknowledgement by B of such terms, or acts of B consistent with such terms as wages and the 5 per cent commission would establish your case in a court. The fact that B paid the commission on the sale of three batteries is stray evidence for you.

B may not, after making the contract for A's services refuse to pay him accordingly, on the ground that he is receiving all he is worth at $40 week.

From the facts A should be able to collect all wages and commissions as claimed by him.

In event of bankruptcy A's wages would be given a preference over general creditors. The courts are now holding that commissions earned by salesmen are preferred claims and A should be able to have the commissions allowed as preferred claims in bankruptcy.

RENTING CARS WITHOUT DRIVERS

Q—We are desirous of knowing the system used by liveries renting cars without drivers to people. Advise what deposit and rate is charged as we would like to place our used cars on this market.—Pioneer Auto Co., Seattle, Wash.

The Chicago Used Ford Exchange and the Avondale Garage, Chicago, have a system of car rental which we believe will meet with your approval. A deposit of $65 is required and charge of 15 cents per mile and 20 cents per hour, this is shown by a hubometer.

The time limit on a car is one week—at the end of this time, the car is returned to the garage and deductions made for wear and tear, the deposit being used for this.

An application is made out by the renter which is, in all respects similar to the purchasing statement, references and bondsmen being named.

WEIGHT OF DODGE POWER PLANT

Q—What is the weight of the Dodge motor with transmission?

2—What is the weight of the complete Ford power plant?

3—Is the Ford frame strong enough to carry the Dodge power plant without undue strain?

4—Would it be practicable to make this change?—R. H. F., Cheyenne, Wyo.

1—The weight of the Dodge motor with transmission is 600 pounds.

2—The weight of the complete Ford power plant is 230 pounds.

3—The Ford frame will carry the Dodge power plant but should have additional cross members to give greater rigidity.

4—We would hardly wish to say that the installation of the Dodge power plant in a Ford chassis is practicable although it is, of course, possible, and as previously stated the frame should be braced with additional cross members and various changes will be required to make the installation properly.

TIGHTENING CLUTCH ON ESSEX

Q—Advise what kind of a clutch the late model Essex uses and how to tighten same?—E. D. Beekove, Therma, N. M.

1—The clutch is of the multiple disk type with cork inserts. The clutch should operate in oil. After draining old oil the clutch housing should be refilled with one pint of a mixture of half kerosene and half high grade engine oil.

A pipe plug in the clutch housing is removed in order to pour in the lubricating mixture. The clutch throwout bearing is lubricated from the transmission and requires no attention. The only adjustment on the clutch is on the clutch pedal under the floor board. The wear of the clutch control can be compensated by turning up the set screw until the pedal resumes its former position.

CURRENT FROM FORD MAGNETO TO OPERATE GROWLER

Q—Could the current from a Ford magneto be used to operate a growler for testing armatures?—A Reader, Olustee, Okla.

1—The current from the Ford magneto would be suitable for use on a growler but would require a specially designed growler, as the voltage obtained from the Ford magneto varies from 6 volts up to 26, whereas the regular growlers on the market are designed for 110 volts.

The change in design would affect the winding only and would require fewer turns of heavier wire, the exact amount being obtained by experiment or else by very difficult electrical calculation.

The Readers' Clearing House

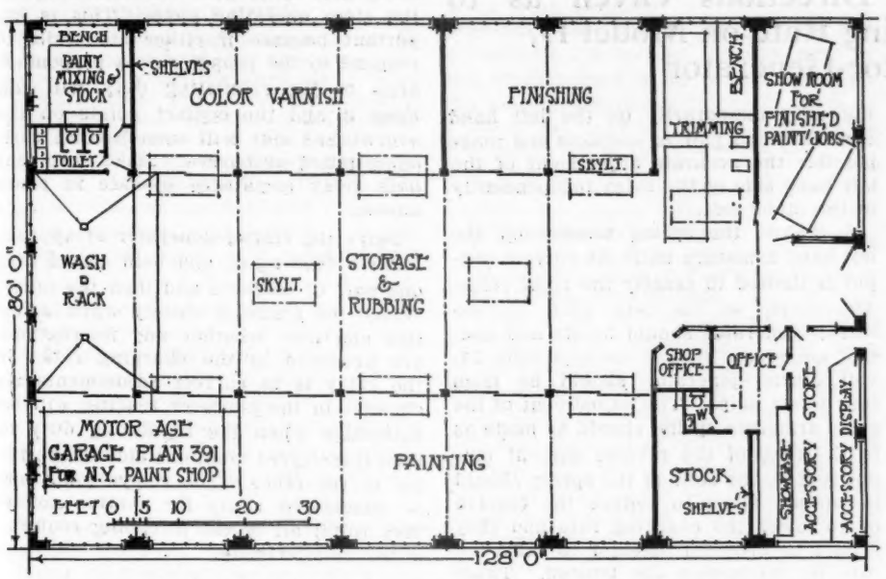
THIS department is conducted to assist dealers and maintenance station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Address of business firms will not be published in this department but will be supplied by letter.

Technical questions answered by B. M. Ikert and P. L. Dumas; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; Tires, by a practical tire man; General Business Questions by MOTOR AGE organization in conference.



Space to display finished jobs is an important factor in selling paint service

Architectural Service

IN giving architectural advice, MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, maintenance stations, garages, dealers' establishments, shops, filling stations, and, in fact, any building necessary to automotive activity.

When making request for assistance, please see that we have all the data necessary to an intelligent handling of the job. Among other things, we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

Plan for an Up-to-Date Paint Shop

PLAN NO. 391

Q—Note your offer of advise and service. Here is our problem: We are going to build a paint shop 80 x 128 ft. as a special department of our business. Our plans are to build these dimensions, one story, truss roof, no posts, factory glass on three sides, two stores in front, twelve ft. entrance in middle.

We would be glad to hear from you as to how you think it should be laid out and anything in particular that you can tell us in starting a high-class paint shop.—N. Y. Paint Shop.

A space 80 ft. wide with light all around would be ideal for paint shop use. With this width it would be possible to partition off shops 20 to 22 ft. wide along each side in which all the painting could be done while the center space would be left for general storage, rubbing, body repairing, washing, cleaning, etc.

If instead of permanent partitions sliding doors be used, all the cars in the paint rooms are immediately accessible without disturbing others. As laid out, this shop would handle 22 cars at once in the painting process, disregarding those in the process of washing, cleaning, trimming, etc.

You speak of two stores in front, but do not say what they are to be used for. We suggest that you use one for a showroom to display some of your finished jobs suggesting to the customer that the varnish should age a few days before being used. There is nothing that sells a paint job like the sight of another job, especially if the prospective customer knew the car before it was painted, it's catching like the desire for new clothes.

On the other side an accessory store specializing in equipment that could be used in retrimming and rebuilding would be a money-making department.

If this arrangement is used, a series of posts could be placed as indicated between each pair of doors or the doors could be carried on the underside of trusses and the posts eliminated. The latter would be more flexible but the former would save you some money, as the 35 ft. trusses to span the center section would be much cheaper to construct than 50 ft. trusses. The roof over the side sections could be carried on 22 ft. timber of comparatively small dimensions.

The finishing room should be sealed up tight and smooth on the inside to make it dust-proof. The color varnish room could be treated the same way, but this is not so necessary, though both should have plenty of heat both to make the varnish flow and to hasten drying.

As retrimming goes with a good percentage of repaint jobs, it is well to fit up a shop for this work with the necessity benches and machines.

STARTING SWITCH ON LOZIER

Q—We would like to know who built the starting switch for model 82 series 121 chassis No. 9248 Lozier car.—O. Morsman, Memphis, Tenn.

The starting switch used on this car was supplied by the Gray & Davis Electric Co., of Boston, Mass. We have been informed by the local Gray & Davis representative that it is possible that they do not have this switch in stock.

If it cannot be secured at the Gray & Davis factory at Boston it would be well to communicate with the Puritan Machine Co., of Detroit who bought the entire stock of parts of the Lozier Motor Co.

OLD LOW TENSION MAGNETO NOT SUITED FOR LIGHTING PURPOSES

Q—Is it possible to use a low tension magneto such as used on cars six or seven years old for lighting purposes?

2—Does the current from the magneto differ from the current obtained from generators used today?

3—What is the voltage and amperage from these machines?

4—Please advise where books can be obtained on the subject of electroplating. —Wilson W. Culver, Cortland, N. Y.

1—The amount of electrical energy which can be obtained from a low tension magneto is too small to make it practical. For example, about all that is possible is to light one two-candle power tail lamp.

2—Current from a magneto is alternating while the generators used on the cars today give direct current. This does not make any difference as far as operating a lamp is concerned but only direct current is suitable when it comes to charging a battery.

3—The voltage and amperage from the magneto varies considerably, some have rather high voltage and low amperage and some having low voltage and high amperage, but none of them are really suitable for lighting purposes.

4—This information will be given by letter.

REPAIRING RADIATORS WITHOUT GAS

Q—What is the best way to repair radiators and cores if there is no city gas in a small town? Also how could storage battery terminals be burnt out when no city gas is available?—A Reader, Milwaukee, Wis.

When city gas is not available a gasoline blow torch makes a fair substitute. It is also possible to use hydrgen and air. The use of acetylene and oxygen is not good for radiator work on account of the soot which accumulates and affects the surfaces so that it is difficult to make the solder stick. Solder irons can be sufficiently heated by means of a blow torch.

CORRECT VALVE TIMING OF COLE 870

Q—Publish correct valve timing for a Cole 870.—R. P. Deal, Randleman, N. C.

The valve tappet clearance on this engine should be .044 to .006 in. The cylinders are numbered 1, 2, 3, 4 on the right side beginning at the front and 5, 6, 7, 8 on the left number 5 being front cylinder on left side of engine. The order of firing is 1-8-3-6-4-5-2-7. There being eight cylinders firing to every two revolutions of the crankshaft, the power strokes will come 90 degs. apart. The exhaust valve should close 10 degs. after upper dead center, the intake open 15 degs. after upper dead center.

Correction of Improper Directions Given as to Adjustment of Charging Rate on Model D, North-East Motor-Generator

This correction is intended to rectify the variation in the direction given to F. Cats, of Bishop, Cal., and the Surrey Garage of Surrey, N. D., in regard to regulating output of a North-East model D, starter-generator. The correct directions as supplied by the service engineer of the North-East company are as follows: Since the output of the model D starter-generator is controlled principally through the action of the current limiting relay all alterations in the charging rate are to be made by adjusting this relay. The limiting relay as well as the reverse current cut-out is always carefully adjusted and tested before leaving the factory, and other ordinary circumstances should not require further attention.

If repairs have been made on a limiting relay or a new one has been installed it is necessary to readjust and test the relay before placing it in service. Before any actual electrical adjustments of the charging rate are to be attempted the limiting relay must be accurately adjusted mechanically in accordance with the following directions: The mechanical adjustments on the relay should be made with it permanently installed in the relay unit assembly and the complete unit detached from the starter-generator. First, examine the contacts points and note the condition of their working surfaces and also the alignment of their edges as well as their faces. The edges of each pair of contact points should be in alignment and their faces exactly parallel.

The air gap between the contact points on each pair when fully separated should be .025 in. Bend the contact points with a pair of pliers until the edges of the contact points are in close alignment when the air gap is approximately correct. If the working faces of the contact points should become uneven or burned they should be filed carefully with a file until they are smooth and flat. The charging rate for the model D is set by adjusting the spring tension on the limiting relay armature. The two armatures or the relay must be so adjusted that they will begin to operate as soon as the current output reaches the rerequired value, and permitted from rising further. With the generator being driven at a speed of 1500 or 1600 r.p.m. both pairs of the limiting relay contact points should be held closed and the ammeter reading noted.

Under these conditions it should be at least 10 amperes. A lower reading indicates trouble elsewhere which should be questioned before the relay adjustment is to be attempted. Keeping the speed constant at this point, block the right hand pair of contacts closed by wedging a suitable piece of wood or fiber between the right hand relay armature and the relay core. This places all the regulating duty temporarily on the left hand armature and pair of contacts and make possible the accurate adjustment of the left hand side of the relay independently of the other side.

5—Adjust the spring tension on the left hand armature until the current output is limited to exactly the right value. The output of the type 1264, 12-volts starter-generator should be six and one-half amperes. That of the type 3500, 24-volt starter-generator should be from four to six amps. The adjustment of the relay armature spring should be made as in the case of the reverse current cut-out that is, the coils of the spring should be spread apart to reduce the tension or to lower the charging rate and they should be crowded together to raise the rate by increasing the tension. These adjustments can be made to the best advantage with long nose pliers.

6—After the adjustment of the left hand side of the relay has been completed verify it several times by lowering and raising and starting generator speed between 1200 r.p.m. and 2500 r.p.m.

7—If this adjustment proves to be correct, remove the wedge that was inserted between the right hand armature and the relay core and insert it between the left hand armature and relay coil to hold the left hand pair of contacts closed. The entire regulating duty will now be thrown temporarily upon the right hand side of the relay.

6—Carry out the adjustment of the right hand side of the relay the same as the left hand side.

9—After adjusting the right hand side, test it thoroughly under varying speed conditions as was done to the left hand side adjustment.

10—Remove the wooden wedge and repeat the speed test with both sides of the relay operating. The charging rate should remain exactly the same with both sides of the relay working at the same time as it was with either one of the sides operating alone. This is important because if either side fails to respond to the proper rate a preponderance of the regulating duty will fall upon it and the contact points on the overworked side will soon become seriously pitted or burned. Make sure that both relay armatures operate in exact unison.

Drive the starter-generator at approximately 2000 r.p.m. and hold closed first one pair of contacts and then the other. Watch the ammeter closely while doing this and note whether any fluctuations are produced in the charging rate If the relay is in correct adjustments no changes in the ammeter reading will be noticeable when the regulating duty is thus transferred from one side of the relay to the other. The relays must not be considered ready for service unless they fulfill all of the foregoing requirements satisfactorily.

SIX CYLINDER BOSCH MAGNETO CONVERTED

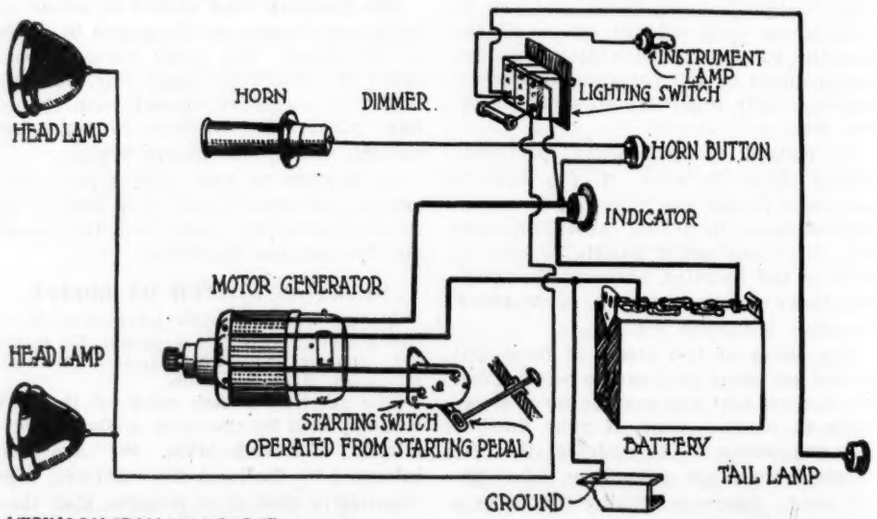
Q—Can a four or six cylinder Bosch magneto be converted into a two spark system, or double distributer system?—Max Sonduck, Wausau Auto Wrecking & Parts Co., Wausau, Wis.

It is possible to convert a single spark Bosch magneto into a double distributer magneto, but the cost of the conversion would not be in keeping with the cost of a new magneto. Only a few of the original parts of the single spark magneto could be utilized on the double spark magneto. This conversion requires a new magneto casing or casting and about the only original part left would be the breaker assembly.

WIRING DIAGRAM FOR 1916 DODGE

Q—Give us wiring diagram for 1916 model Dodge car No. 86998. This car has the Northwest motor generator and old style starting switch No. 2365. Harbridge Motor Co., Keosauqua, Iowa.

1—Wiring diagram is given below as per your request. The style of the starter switch does not effect the electrical circuits.



WIRING DIAGRAM 1916 DODGE *100545

EXPLANATION OF S. A. E. HORSEPOWER RATING

Q—We would like explanation as to the S. A. E. horsepower rating on various cars. For example the Ford car is rated 20.5 horsepower while the Buick four is rated at 18 and the Chevrolet is rated at 21 horsepower.

1—The S. A. E. horsepower rating is based on a piston speed of 1000 ft. per minute. Also on the bore and the number of cylinders. Consequently, a car which has an engine with small pistons will have a low horsepower rating, although it may be possible on account of its light design to go at a much greater speed than is considered in the S. A. E. rating, consequently its actual horsepower will be considerably in excess of its rated horsepower and it is possible that it may actually be more powerful than some other engine with a greater rating.

To find the S. A. E. rated horsepower multiply the bore by itself and by the number of cylinders and divide by 2.5.

2—Give the S. A. E. also the maximum brake horsepower developed by the following cars: Ford, Chevrolet, Overland, Maxwell, Buick four, Packard Twin Six, Marmon Six, Cadillac eight, Locomobile Six, Pierce-Arrow Six, and Duesenberg eight.

2—The information in regard to the maximum horsepower developed by these different cars is not available and the manufacturers are not very desirable of sending this information broadcast. However, if you are interested in some particular make it would do no harm to write to the factory and ask for this information. If you wish to obtain the S. A. E. rating on any of these engines it can easily be determined by the formula given in answer to number 1.

3—About how many different makes of passenger cars are there in the United States of America?

3—There are at present 135 factories building passenger cars but this number is changing continually and in addition there are, of course, numerous makes which have been made in the past but are no longer in production.

4—In what year was the first gasoline motor car invented?

4—The first four-wheel automobile driven by gasoline engine was made by Daimler in Germany in 1866.

5—Was the first gasoline motor car made in the United States or in Europe?—A Reader, Algoma, Wis.

5—The gasoline car was developed in Europe as indicated by answer No. 5.

CHEVROLET INFORMATION

Q—What common make of engine or car do you think would make a good fast half mile dirt track racing car with the necessary rebuilding and replacement parts?

1—The makes of cars most often found on the half-mile dirt track are the various Ford speed creations, the Essex Dodge, and Templar cars. Anyone of these three cars should make an excellent half-mile dirt track racer. Of course, the amount of money to be expended will determine just what one of the three to use.

2—Will a Buick cylinder head fit on a Chevrolet 490 block?

2—No.

3—How short should a car for half-mile track work be made?

3—Not less than 86 inches and not more than 110 inches. Some length in the neighborhood of 90 to 100 inches is the average length.

4—Do you know of any company handling racing parts for Chevrolet 490?

4—No.

5—Is there any magazine published especially for people interested in racing?

5—None to our knowledge.

6—Do you think it advisable to build a racing car from a Ford?—DeVersy & Sons Garage, Vernon, Ind.

6—Some of the rebuilt Fords have been unusually successful in prize winning on the half to one mile dirt track. Some of the Fronty Fords built by Chevrolet Brothers have equalled the world's half-mile dirt track record. Rebuilding a Ford for racing presents many advantages over any other car, first because of the fact that it is comparatively inexpensive and the cost of upkeep is not as great as with any other make due to the low cost of replacement parts.

There are also several companies who are devoted exclusively to furnishing various equipment for adding to the speed of the Ford. All of these things tend to make the Ford a favorite among dirt track drivers.

COMPARATIVE HEAT VALUES OF KEROSENE AND GASOLINE

Q—Does gasoline or kerosene have the greatest number of heat units per gallon?

1—Gasoline has 18,000 B. T. U. (British Thermal Units) per gallon while kerosene has 19,000 B. T. U.

Power of Fordson Tractor

2—Will a Fordson tractor which will run on either kerosene or gasoline have as much power on gasoline as it will on kerosene?

2—The power developed by a Fordson Tractor should theoretically be slightly greater using kerosene than gasoline on account of the greater number of heat units although in actual practice it may be difficult to tell the difference.

Richer Mixture

3—With the needle valve set the same for both gasoline and kerosene will the gasoline vaporize faster and give a richer mixture than kerosene?

3—As gasoline evaporates easier than kerosene a greater volume will be vaporized under similar conditions but as the weight per unit volume is less it is apparent that the weight of fuel vaporized will be very nearly the same under similar conditions. Such questions are, however, difficult to answer as questions of vaporization and fuel mixture are effected considerably by the design of carbureter and engine.

Duty of Piston Rings

4—Are piston rings supposed to turn on the pistons? Does gum on a piston ring prevent it from expanding?

4—Piston rings should not turn on the piston for if the piston is slightly out of round the ring would never wear to fit the cylinder. Gum on the piston ring will, of course, hinder its free expansion and contraction in the piston ring groove but of course, the amount of interference will depend on the degree to which the piston ring is gummed up.

Life of Batteries

5—Does the life of a set of lighting plant storage batteries depend on a certain number of charges and discharges and is a slight discharge and a slight charge as hard on a set of batteries as a two-third discharge and a two-third charge.

5—Storage batteries are injured by being left in a discharged condition which allows the sulphate in the plates to harden to a form of sulphate which is difficult to change back into active material and sulphuric acid. On the other hand excessive overcharging keeps the plate material in very soft condition so that some of the active material may drop off and fall into the sediment chamber in the bottom of the jar.

Occasional overcharging is, however, recommended in order to prevent the condition first mentioned. Another harmful condition is a charging rate which is high enough to bring the temperature of the battery above 100 degrees Fahrenheit. If none of the above detrimental effects are encountered we doubt if there is any appreciable difference between a partial charge and a two-third charge and discharge.

Charging Load Condition

6—As there are no governors on farm lighting plant engines (Delco), does the charging load continue the same regardless of battery condition or is the charging rate controlled to varying conditions by some device so that the load on the engine will be the same whether the batteries are empty or full?—Arthur Nelson, Cherokee, Iowa.

6—The statement that there are no governors on farm lighting plant engines, especially referring to Delco, applies only to the smaller size in the Delco plants as these are made in a great number of different sizes. On the small sizes the charging rate to the battery is substantially the same no matter whether the battery is charged or discharged. On medium size Delco plants a flyball governor is used which gives constant speed to the engine but the spring tension on the governor is variable by means of a lever so that the charging rate can be varied from 18 to 33 amperes depending on the battery requirements.

The large Delco plant capable of delivering 3 kilowatts has a voltage regulation by means of throttle control which holds the speed between 1,000 and 1,225 r. p. m. When the battery is in a discharged condition the engine is allowed to run at the higher speed and as the voltage comes up the throttle is automatically partially closed so as to lower the generator speed and reduce the charging current. Under normal conditions the battery is kept about ¾ charged and the speed of the engine is such as to supply all the energy required unless this is in excess of 3 kw., in which case current is drawn from the battery. To bring the battery up to full charge, however, the engine should be run when no current is being taken from the plant.

Using Two Batteries on Packard Six

Q—We have a Packard six, model 1-38, 1914, which has two batteries, one of which is for starting and lighting while the other, which is a 40 ampere hour battery, is used for ignition only. The starting and lighting battery has two wire systems and is kept charged by the generator, but there is no generator to keep the ignition battery charged. We wish to install a separate generator to take care of this battery and contemplate using the generator now supplied as standard equipment on the present model Ford car. Can the Ford generator be used and on which side is it grounded?

2—If not grounded on the same side as the battery, will it reverse itself?

3—The car has an exposed pump shaft for driving purposes and place for mounting. Advise ratio of driven and driving gears.

4—If the above mentioned generator can not be used, advise one that can, bearing in mind that we wish to have a light weight proposition and that the regulator and cutout should be combined with the generator.

5—Can a grounded battery be so connected to a non-grounded generator that the battery will be charged?—A. N. Tucker, Fort Worth, Texas.

1—The Ford generator is all right. The polarity of the ground being of no consequence, as the battery can be connected to it anyway and the cutout points closed which will automatically magnetize the generator in the right direction so as to charge the battery.

2—While a generator if connected the wrong way to a battery will usually reverse itself it is best to close the cutout points once by hand before starting up.

3—The water pump shaft gear has 28 teeth and the crankshaft gear has 33 teeth so that the water pump shaft runs about 20 per cent faster than the crankshaft. As the Ford generator is designed to run 1½ engine speed would suggest direct connecting the generator to the water pump shaft for while the speed of the generator will therefore be a little less than on the Ford car, we believe this will be all right as the ignition battery will not require very much current to keep it in a charged condition.

4—Ford generator is all right.

5—It is not desirable to connect the grounded battery to the two-wire generator as this puts a ground on the two-wire system and another ground will put a short in the system.

TROUBLE WITH FORD ENGINE AND TRANSMISSION

Q—We have a Ford car in which the engine and transmission has been overhauled and after finishing the job we found that the car would work all right in reverse. The brake was all right and the car would run all right in high but worked very poorly in low speeds. We also found that when the engine was cold, the low speed worked a little bit but when the engine was hot the low speed would hardly hold at all.

New bands were tried also bands with cork inserts and after these had been tried a while we removed them to see if they were burnt or badly glazed and found that they seemed to be in a good condition. It is possible to have the engine running and step on the low speed pedal as hard you wish without appreciable results. What is the trouble?—Jos. Poettgen & Son, Freeburg, Missouri.

1—We would suggest that you take off the slanting door on top of the transmission and with the engine running, operate the low speed pedal to see if the low speed drum is held from revolving and if it is there is no trouble in the bands. In this case it is possible that the rivets are sheared which hold the low speed drum to the flange.

This would, of course, require removing the engine and rechecking the transmission. If the band does not hold the drum, however, and it continues to turn, it is possible that the pin is sheared which holds the pedal and cam to the band operating shaft and in checking this you should make sure that the pedal is not hitting toe board, preferably removing the toe board when making this test. We believe you will find trouble in either one place or the other.

Nativity of Various Foreign Cars

Q—Tell me the make of the following foreign cars, whether French, Italian, etc., the number of cylinders and cylinder dimensions and number of gear box speeds. If more than one chassis is made, define all. SCAP, Delahaye, D. F. P. Beck, Lanchester, Alva, Delaugere-Aries, Imperia and Sigma.—Ray M. Ramminger, New Holstein, Wis.

The S. C. A. P. car is manufactured in France, has a cylinder bore of 2.99 by 5.12 stroke four cylinders and has four speeds forward. The Delayhaye is made in three chassis, one of 118 in. wheelbase, one of 129 in. wheelbase and one of 136 in. wheelbase. Two are four cylinder chassis and one is a six. The 118 in. wheelbase has a four cylinder engine, 2¾ by 4.72 bore and stroke and has a four speed transmission.

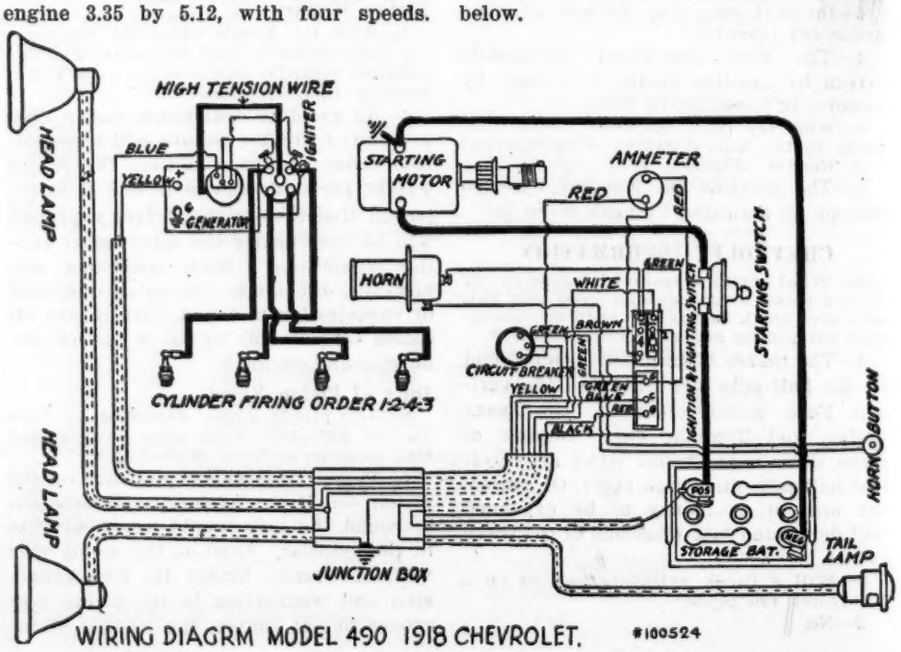
The 129 in. wheelbase chassis carries a four cylinder engine 3.35 by 5.12 with four speeds. The six cylinder 136 in. chassis is equipped with a six cylinder engine 3.35 by 5.12, with four speeds. The D. F. P. stands for Doriot Flandrin & Parrant.

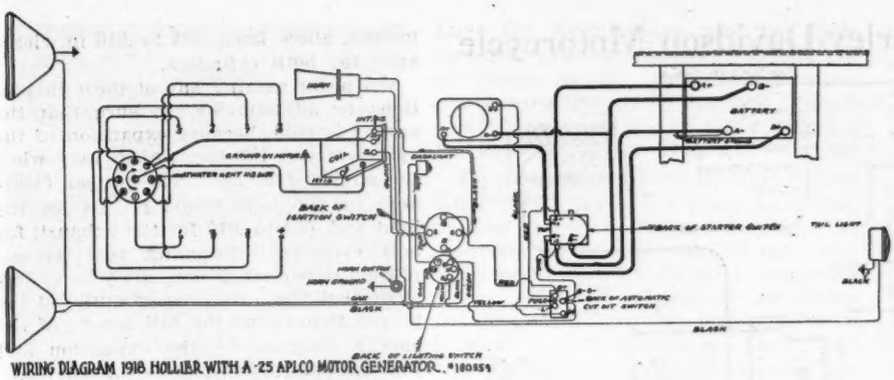
The D. F. P. car is made in two chassis. The 110 in. wheelbase carries a four cylinder engine, 2.16 by 4.72, with a three speed gear set. The 119 in. wheelbase chassis has a four cylinder engine 2.75 by 5.12 with a four speed transmission gear set. The Beck is a French car equipped with a four cylinder engine 2.56 by 4.12 with three speed transmission gearset. The Lanchester is of British manufacture is made in one model only, carrying a six cylinder engine 4 by 5 in. bore and stroke with 3 speeds forward. The Alva is of French manufacture, 118 in. wheelbase four cylinder engine 2.95 by 5.12 four speed transmission gearset. The 116 in. wheelbase carries a four cylinder engine, 2.75 by 5.51 with four speed transmission gearset. The other chassis is of 125 in. wheelbase with four cylinder engine of 3.35 by 5.51, four speed transmission gearset. The Aries is also of French manufacture and is made in three models all are four cylinder engines. The 114 in. wheelbase model carries a four cylinder engine, 2.83 by 4.73, four speed transmission gearset. The 99 in. wheelbase model carries a four cylinder engine, 2.36 by 3.85. It is equipped with a three speed transmission gearset. The 118 in. wheelbase model is equipped with a four cylinder engine, 3.15 by 5.52, and carries a four speed transmission gearset. The Imperia is of Belgium manufacture, 130 in. wheelbase, four cylinder engine, 3.1 by 7 in. with four speed transmission gear set. The Sigma is of French manufacture, 113 in. wheelbase four cylinder engine, 2.56 by 4.72 four speed transmission gearset.

WIRING DIAGRAM OF CHEVROLET 490

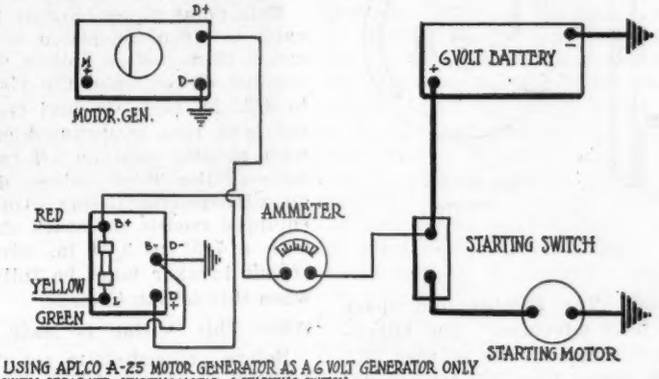
Q—Supply us with a wiring diagram of Chevrolet model 490 1918. G. D. Martin, Rochester, Pa.

1—The diagram requested is shown below.





WIRING DIAGRAM 1918 HOLLIER WITH A-25 APLCO MOTOR GENERATOR. #180551



USING APLCO A-25 MOTOR GENERATOR AS A 6 VOLT GENERATOR ONLY WITH SEPARATE STARTING MOTOR & STARTING SWITCH #180550

CONVERSION OF APELCO SYSTEM FOR 6 VOLTS

Q—We have a Hollier touring car model No. 206, equipped with Continental 7W engine and Apelco model A-25 motor-generator with 12-volt battery. We wish to change this to a straight 6-volt system using the present motor-generator as a generator only as we will install a separate starting motor and starting switch, the starting motor operating by means of a gear on the flywheel. Publish wiring diagram suitable for this installation. This to include an ammeter and the Apelco indicating automatic cut-out.

2—How is the amperage of the Apelco motor-generator regulated? Is the brush at the top of the commutator in this unit the third brush?

3—Is there any other make of car using the same transmission, propeller shaft and rear axle as the Hollier model 206?

4—What is the maximum speed this car will make?—A. A. Renno, Baltimore, Md.

1—A wiring diagram of the whole car is shown above at top, while a wiring diagram of the parts you wish to change is shown above, at bottom. No wiring needed on the M terminal.

2—Regulation is by means of a reverse series winding. There is no third brush regulation, the brush you see on top being one of the four regular brushes.

3—This information will be given by letter.

4—50 m. p. h.

ABSENCE OF FELT WASHER PERMITS GREASE LEAKAGE

Q—We are having trouble with a Model G 1918 Grant car leaking grease from the front end of the main transmission shaft. The bearings in the transmission have been renewed and are in first class condition, shafts test true in lathe. Give us the address of the Durstan Company who make this transmission and advise the part number of this washer either Durstan or Grant list.—H. H. Hines, Care Fisher Road Auto Co., Troutdale, Oregon.

The washer referred to is known as the engine clutch gear bearing felt washer its number on the Grant parts price list is 8T-37. This washer is a continuous circular washer but a strip of felt approximately 7/16 by 7/16 width and thickness can be used and it is inserted in the front bearing retainer, but to install it is necessary to remove the transmission. This retainer is just in front of the transmission case mounted on the outside of the transmission case. The Durston transmission is manufactured by the Durston Gear Corp., 25 Maltbie St., Syracuse, New York.

SPECIFICATIONS OF G-1 DUESENBERG ENGINE

Q—Give complete specifications on the Duesenberg four-cylinder engine as used in the 1921 Roamer.

2—When was the first engine built, that is identical with the one used in the 1921 Roamer, and how old it is possible for this engine to be?

3—Give distance from the front end of the crankshaft to the back end of the transmission, that is the over-all length of the power plant.—Thomas Hofmeister, Overlea, Md.

1—The Rochester Duesenberg engine G-1 model is a four-cylinder valve-in-head, 4¼ in. bore, 6 in. stroke. The cylinder head is integral with the cylinder casting. Pistons are of aluminum alloy. There are three rings on each piston. The piston pin diameter is 1¼ in. The length of the piston is 4¾ in. The wt. of the piston is 16.9 ounces. The valve clear diameter is 2 in.

The valve lift is 31-64 in. The valves are made of an alloy containing tungsten. The crankcase is of aluminum. The lubrication is pressure through hollow crankshaft. The pump is of the gear type. The cooling is by a centrifugal pump. The connecting rods are manufactured from carbon steel and measure 12 in. from center to center of bearings. The connecting rods weigh 54 5-16 oz.

The crankshaft is of carbon steel. There are two main bearings. The connecting rod bearings or the crankpin diameter is 2 5-16 in. The diameter of the main bearings is 2.98 in. The size of the rear main bearing is 4 5-16 in. long. The camshaft is located in the crankcase, and is driven by silent gears from the crankshaft. It delivers its maximum h.p. at 2500 revolutions. Its weight empty is 575 lbs. The overall width is 26 in. The overall height is 34½ in. The overall length of engine only is 40 1-16 in. and it is machined to take an S.A.E. bell housing No. 3.

2—This information must be secured from the Rochester-Duesenberg Engine Co., Rochester, N. Y.

3—This information is not available at present.

ELECTRIC OVEN FOR SOFTENING COMPOUND ON BATTERIES

Q—Can you supply us with the necessary information to enable us to construct an electrically heated oven to soften the compound on batteries preparatory to opening up the cells. The capacity of the oven must be large enough to handle one 12 volt automobile battery at a time. The current supplied by the city power plant is 110 A. C.—R. E. Holland, Miami, Okla.

1—We would be glad to investigate this matter for you and give the necessary information if we consider that the scheme would be at all practicable. However, the cost of electric current in order to produce heat is rather excessive for this purpose and it is our opinion that a steam box in which the battery is placed is not only entirely practical but very much easier to construct and very much cheaper to use.

All you need for the purpose is a wooden box big enough to hold the batteries that need steaming and instead of limiting it to one battery it can be made to hold two or three. Two or three holes can be made in the box and rubber tubes run in to carry the steam. The steam can either be obtained from one of the battery steamers on the market or you can take an empty oil can and solder a spout on it and use a rubber tube and if carefully watched to see that the water is maintained at a fair level there will be no trouble in using such an outfit.

If there is any real reason why the steamer is not satisfactory we shall be glad to secure the electrical information but we believe that as hundreds of others have done it you will find it admirably suited to your purpose.

Maintenance Data on Harley-Davidson Motorcycle

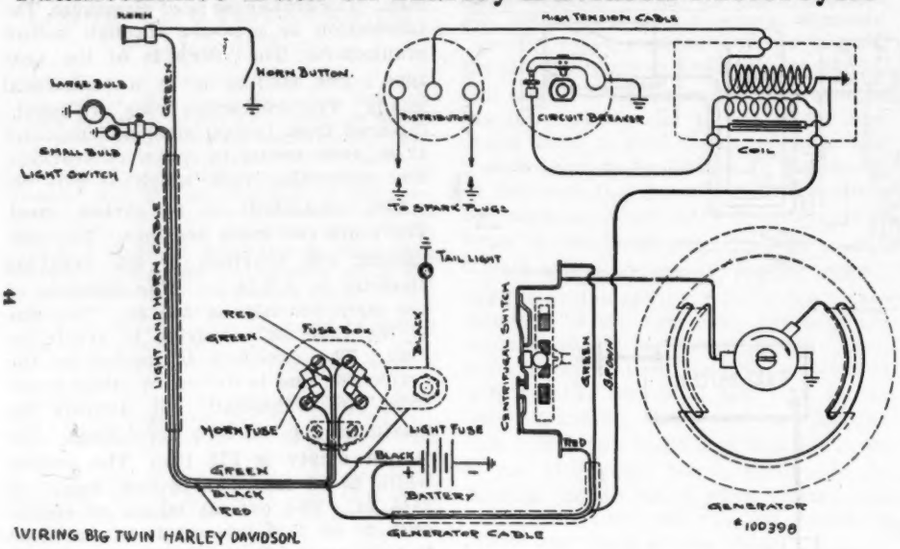


Fig. 1

Q—Publish a wiring diagram of the Harley-Davidson external electric system.

2—Give adjustment of the carbureter.

3—Give diagram and explanation of valve timing, and ignition timing.—N. Blondy, Detroit, Mich.

1—The wiring diagram is shown in Fig. 1.

2—To obtain proper adjustment on this carbureter it is necessary first to run the engine until the manifold is warm. The most flexible adjustment can be made around 12 o'clock noon. Open the throttle far enough so that the cam "J" shown in Fig. 3, which is on the cam casting "K," moves about 3/16 in. under the roller "G" of the lift lever. Refer to arrow "M," in illustration, showing this position. Be sure to measure this distance from the closed throttle position; then turn the knurled nut "I" on the needle valve "E" to the left or right, as may be necessary to make the engine fire evenly. Have the engine running idle with a fully advanced spark while making this and the low speed adjustment.

To make the low speed adjustment, close the throttle and allow the engine to run for a minute, listen to the exhaust reports and determine whether or not the mixture is rich or lean. A rich mixture will cause the engine to lope and fire irregularly, while a lean mixture will cause spitting or popping in the carbureter and possibly stop the engine. Turn the idler adjustment screw "L" out of the carbureter 1/16 in. Then turn the large grooved screw "D," into which the end of the cam is hooked, inward or outward, as may be necessary to make the engine fire evenly with a closed throttle. Turning the screw inward increases the amount of gasoline, while turning it outward decreases it. The small screw "O" is to lock the adjusting screw "D" after obtaining the proper setting.

The carbureter is now ready for the high speed adjustment. Do not make the adjustment with the engine running idle. The machine should be run at high speed on the road. The throttle and spark should be fully advanced. The adjustment is now made by the pointer "Z," which as it moves from "I" toward "3" increases the supply of gasoline. Moving the indicator from "3" toward "1" cuts down the supply of gasoline. When the indicator reaches the right point, the engine will run without missing or backfiring. The air lever on the side of the mixing chamber should be opened when extreme high speed is desired. Be sure to shut this port before the engine is stopped, because you will find it difficult to start the engine with this port open. The float level should be 19/32 in., which means from the top of the float to the top of the bowl measured on the outside of the float bowl. The air valve is equipped with an adjusting device. Sometimes slightly tightening or loosening the air valve sprisg tension, which is done by turning nut "B," will improve the running of the engine. Under normal conditions the pressure of the air valve against the seat should be seven ounces, when the starting stem is entirely released.

3—Before proceeding to retime the the valves, see that the exhaust lifter pin and inlet push rods are adjusted as recommended here. On all twin-cylinder electrical equipment models produced to-date, allow .004 in. clearanca between exhaust lifter pins and exhaust valve stems or caps. Allow .004 in. clearance between the inlet levers or rocker arms and the valve stems. This applies to all models. On the 1915 and 1916 twin motors, allow .004 in. lifter pin clearance for the rear cylinders and .006 in. for the front cylinders. For 1917 and 1918 motors, allow from .008 to .010 in. clearance for both cylinders.

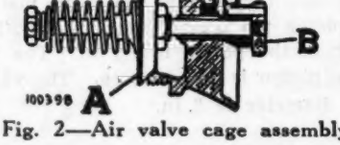


Fig. 2—Air valve cage assembly

Whenever making any of these inspections or adjustments, be sure that the engine is cold, because expansion of the cylinders and lift mechanism vary when the engine gets hot. The proper clearance on the L-20 model is .004 for the inlet and .008 to .010 for the exhaust, for both cylinders. Assuming that the explosion is perfect, it can easily be understood that there must be an outlet at the proper time to get the full benefit of the energy obtained by the expansion and prevent possible injury to the engine.

This point of opening of the exhaust valve is when the piston is between 3/4 and 9/16 in. before bottom center. The exhaust closes when the piston is 1/32 to 3/32 in. past top dead center. Since the inlet cam is mounted on one gear with exhaust cam on all twin-cylinder motors, the inlet valves do not require independent timing. On electrically equipped models the spark should be set with a 7/32 to 9/32 in. advance. The circuit breaker must be fully advanced when this setting is made.

When This Setting Is Made

Before proceeding to set the time of ignition on any model, be sure that the circuit breaker is fully advanced and that the points are properly adjusted. To assure releasing the exact volume of crankcase compression at the proper time, all engines are fitted with a relief or breather valve. All generator equipped twin engines, beginning with 1914, are fitted with a mechanically operated rotary release valve. The ports in the sleeve of the release valve must be open between 1/16 and 3/32 in., when the front piston is on top dead center. This port opens gradually when the engine is turned in the direction it runs, and closes when the piston has reached bottom dead center. Correct timing of this valve will allow the vacuum which is formed when the pistons are on their upward stroke to draw the oil and oil vapor to all bearings and cylinder surfaces exposed, insuring proper lubrication.

Timing the Ignition

Assuming that all of the gears have been removed but that no new gears have been fitted, it is a simple matter to retime the engine correctly according to the following: Place the pinion gear on the flywheel shaft, fit the key and the pinion lock screw, then fit the release valve. On 1916, 17, 18 and L20 model engines, line up the pinion with the "U" mark stamped in the crankcase. Before fitting this gear, be sure that the engine is in such a position that the mark on the driving pinion is in perfect alignment with the secondary gear stud and lifter arm stud. It is always advisable to check over the timing after a gear has been set according to marks. We therefore urge that the timing of this release valve be checked over to see whether it corresponds with the timing mentioned previously in this article.

After the release valve has been properly fitted, place the secondary gear on the stud in such a manner that the

Fig. 3

marks will line up with the marks on the pinion gear. In order to get this result with the 1914 and 1915 engines, the engine must first be turned until the mark on the pinion gear is in an upward position.

The secondary gears on all 1915, 16, 17 and 18 engines have two marks. Be sure to place the gear on the stud in such a position that the other mark will be toward the intermediate drive gear. Exhaust valve timing can now be checked over, and must be within the limits already mentioned.

Fit the drive case after being sure that the marks in pinion and secondary gear are in line. Then place the intermediate gear so that the marks of this gear and the mark on the secondary gear line up. After the intermediate gear has been placed in position, the engine should not be turned again. Intermediate worm gear is then placed on the stud in such a way that one of the marks of this gear and the intermediate gear line up.

To time the ignition on the models fitted with a model 2-5 Remy generator, proceed as follows: Proceed to time the generator by first placing all the gears with marks in line on their respective studs. Turn the engine to the firing position, which is when either piston is between 7/32 to 9/32 in. before top center on the compression stroke. Remove the Bakelite distributer cap and the high tension distributer segment. Remove the hexagon not clamping the circuit breaker cam. Advance the circuit breaker as far as it will go by pushing it forward and moving the cam on the shaft in the direction that it runs so that the circuit breaker points are just starting to break contact; then tighten the cam clamp nut securely. Be careful when fitting this cam not to use the wrong cam for the cylinder that is being timed. The small lobe times the front cylinder, while the large lobe times the rear cylinder.

After the cam has been properly checked and securely clamped, check over the timing and, if it is all right, place the high tension distributer segment over the end of the shaft in such a position that the driving pin on the cam lines up with the provided hole in the distributer segment. The Bakelite distributer cap can then be placed over the circuit breaker assembly, it being only necessary to line up the top of this cap with a slot in the supper edge of the timer head, securing it by means of the springs. The long front cylinder cable should be placed into the extreme right terminal of the distributer cap.

Functioning of E. M. F. Oiling System

Q—Publish diagram of oiling system on an E. M. F. 1912 Studebaker model 30. This car was equipped with Splitdorf low tension magneto.

2—Explain what make of high tension magneto is made to fit the same bracket and still line up with pump shaft.

4—Would like to know more about the new car called the Star.—Verne Van Stienburg, Stockport, Iowa.

1—We regret to state that we have no diagram of the oiling system as used in the E. M. F. We can, however, trace its circuit without the necessity of an illustration. The E. M. F. 30 engine oiler is a one gallon reservoir, cast in right hand side of crankcase. The system is automatic in its action and requires no attention other than making sure that it is always supplied with oil and that the filler cap is screwed down tightly with the wrench provided.

Its principle of operation is by vacuum therefore if the filler is not screwed down tightly it will cause an air leak that will release the vacuum and allow the entire reservoir of oil to float into the crankcase into the two supply pipes leading from the bottom of the reservoir to the forward and aft compartments of the crankcase. This will allow an unnecessary amount of oil to flow into the crankcase and will cause smoking.

Two supply pipes run from the bottom of oil reservoir to and projecting through the bottom of crankcase to a point about 5/8 in. from its bottom. With the crankcase dry and oiler full, the air, being lighter than the oil, will pass through the oil supply pipes to the top of the oil reservoir. This action relieves the vacuum in the reservoir and allows the oil (it being heavier than the air) to flow into the bottom of crankcase until the oil in crankcase has reached a height that will cover and seal the mouths of the supply pipes. This process obviously will keep out the air and cause a vacuum in reservoir that will hold the remaining body of oil until such time as the engine has consumed a sufficient amount of oil to cover the supply pipes in the crankcase. This in turn will allow the air to pass through and release sufficient oil to recover the mouth of the supply pipe to maintain a constant level. When the filler cap is removed a 3/16 in. rod will follow it part of the way. The lower end of the rod, in the operation of replacing the oil filler cap, automatically opens the oil valve which when the filler cap is removed returns to a closed position by automatic action. The construction itself is nothing more than a small leather valve that is forced into place by a spring when filler cap is removed. In case this valve should leak while filling it can be taken out for inspection through a hole provided directly under the valve at bottom of oiler.

2—This will be answered by special letter.

3—The firing order of this engine is not in our technical files. It is very easy to determine the proper firing order by observing action of the valves. In this engine the front cylinder is known as the No. 1 cylinder and all data should be taken from No. 1 cylinder. Turn the crank slowly by hand until the exhaust valve on No. 1 cylinder has just opened, then by slowly turning and having another person watch the action of the valves the next cylinder to fire can be detected by the exhaust valve that next opens after the exhaust valve on No. 1 has opened. The exhaust valve to open after the No. 1 exhaust valve has opened will be either No. 3 or No. 2. If it is No. 2 you will then know that the firing order is 1-2-4-3 whereas if the valve on No. 3 cylinder opens immediately after the one on No. 1 has opened the firing order will be 1-3-4-2.

4—A detailed description of the new Star car appeared in the March 23 issue of MOTOR AGE, which probably has reached you by this time.

VALVE TIMING ON 1915 EMPIRE

Q—Tell through MOTOR AGE how to time the valves on a 1915 Empire Model 33?—Roy Hall, Hampton, Iowa.

1—The valve timing on the Empire Model 33 is as follows:

Intake opens after upper dead center 15½ degrees.

Intake closes after lower dead center 35 degrees.

Exhaust opens before bottom dead center 38 degrees.

Exhaust valve closes after top dead center 12 degrees.

When timing this engine probably the easiest method would be to set the exhaust valve. However, there should be marks on the flywheel which should enable you to do this easily but if there are no marks the engine should be brought to a position where the number 1 piston is approximately 1-16 of an in. past upper dead center, that is it should have started down approximately 1-16 of an inch at the most. At this point the chain should be placed over the crankshaft and the valves will be timed.

SERVICE EQUIPMENT

Aids for Time Saving & Accuracy

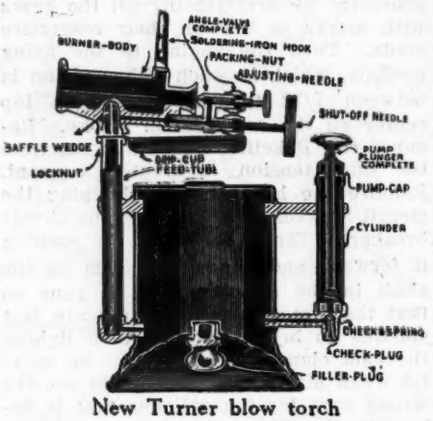
SUTTERS CRANKSHAFT TOOL

This tool has been brought out for trueing crankpins which have become worn oval, or otherwise are out of round. No tools are needed in making the adjustments on it and it either can be used as a hand tool or in combination with a lathe. The lathe attachment can be readily detached when desired. Its use will be understood by reference to the illustration, where A is the drive on the universal centering arm, B, universal centering arm which puts the shaft to center on plate, C, plate which carries shaft, D, universal regulating gages which regulate thickness knife shall cut, E, cutter, or knife, F, blade adjustment, G, lock on tool carriage, H, handle which drives universal regulating gages for light or heavy cuts and K, lathe attachment. The tool will take shafts from 1¼ to 3 in. Three blades are provided to take any width pin. The price is $75. Fred Shaw Mfg. Co., St. Louis, Mo.

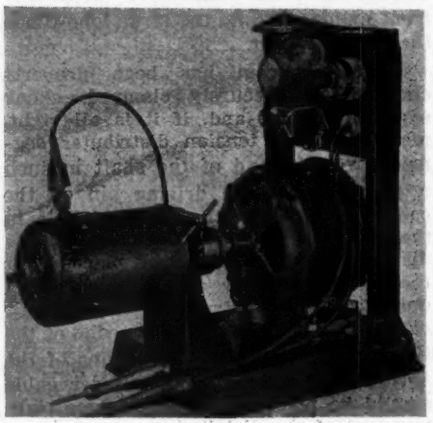
NEW TURNER BLOW TORCH

There are three features in the new Turner blow torch. These are the baffle in the burner tube, the adjusting needle, which is separate from the shut-off and the flared tube in front of the fuel jet. The flame is constantly applied to the baffle heating the fuel to a dry gas, insuring, it is claimed, complete vaporization of the present day gasoline or kerosene. The fact that the adjusting needle is separate from the shut-off makes it impossible to enlarge the orifice. The flared tube automatically syphons the correct proportion of air regardless of the size of flame desired. Other desirable features include the pistol grip handle; safety valve; air release, which releases all pressure when operator has finished with torch and the flexible tube inside tank fitted with strainer to prevent dirt clogging the burner. The pump, also has been materially improved. The torch is made by the Turner Brass Works, Sycamore, Ill.

Two views of Sutter's crankshaft tool



New Turner blow torch

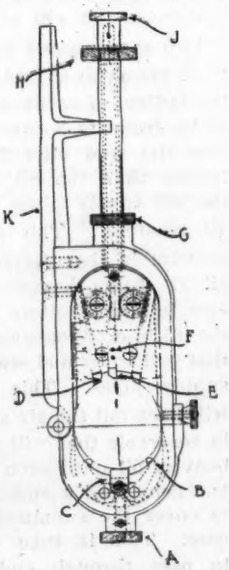


Onan "F" generater test stand

HOLE SHOOTER

The Hole Shooter, an electric portable drill, can be adopted to other uses than that of drilling holes. A number of attachments make this tool useful in more than one way. Among these attachments is a radial portable drill press stand.

Other attachments include a battery terminal opener; end bristle wire brushes of various grades and sizes which are useful in removing carbon from cylinder heads, burnishing work, etc.; saw-wheel on a flexible shaft; rotary taper files; special emery grinding wheels; special buffers, which are used to excellent advantage in polishing bodies as well as for ordinary buffing work, and many other attachments.—A. H. Petersen Mfg. Co., of Milwaukee.



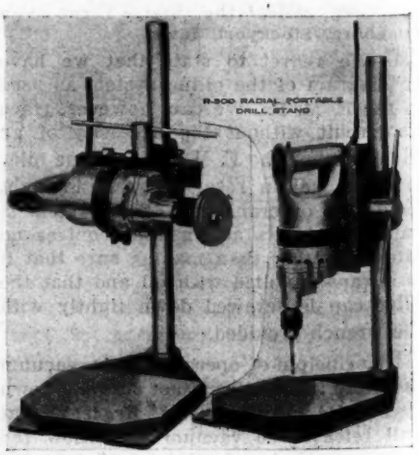
SEPCO ELECTRIC VULCANIZER

This vulcanizer is furnished in one size at the present time with an operating surface of eight in. wide by 20 in. long. Each machine is furnished complete with four adjustable tube arms. Heat is generated by a special electric heating unit which covers the entire base of the vulcanizer. The casing is made of two heavy steel stampings telescoped and welded together providing a hot air chamber between the upper and lower plates, thus only heated air under automatic temperature regulation is directed against the vulcanizing surface and all necessity for water, steam, or pressure is done away with.

Vulcanizer is furnished for bench operation. It is portable and can be connected to any lighting circuit and is furnished in 110 or 220 DC or AC voltage.—Automatic Electric Co., Warren, Pa.

ONAN "F" GENERATOR TEST STAND

The Onan "F" generator test stand is for Ford generators and is equipped with one-quarter h. p., 110 volt A. C. 1740 speed motor. The instrument board is of all metal construction, finished in black enamel. Price, complete, with motor, $58. David W. Onan, 43 Royalston Ave., Minneapolis, Minn.



Hole shooter

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Red Bank, N. J.	Automobile Show	May 6-13
Asheville, N. C.	Automobile Show	May 8-22
Williamson, W. Va.	Automobile Show	May 10-13
Hartford, Conn.	Automobile Show	Sept. 4- 9

FOREIGN SHOWS

Rio de Janiero	Automotive Exhibition	Sept., 1922
Paris, France	Automobile Show	Oct., 4- 15

CONVENTIONS

Detroit	Automobile Trade Assn.	May 9-10
St. Louis	Am. Auto. Assn. Annul Meet	May 22-23
Colo. Spgs., Colo.	Automotive Equipment Assn.	June 19-24
White Sul'r Spgs., W.Va.	S. A. E. Summer Meeting	June 20-24
Olympia	Washington Automotive Trade Assn.	July 21-22

RACES

Indianapolis	500-Mile Classic	May 30
Tacoma, Wash.	Eleventh Annual Race	July 4
Colo. Spgs., Colo.	Pike's Peak Race	Sept. 4
San Carlos, Cal.	500-Mile Armistice Day Race	Nov. 11

Mystery Cars and Rumors Mark Preparations for 500-Mile Classic

BY PAUL DUMAS

WE have heard from a reliable source that Howdy Wilcox is well pleased with the rebuilding job done on his Puegot by the Allison Co. of Indianapolis. Since its overhaul he has given it a flight test or two on the track and says it's fast.

The three Monroes spoken of last week have been formerly entered. This team will be headed by the Hoosier, Tom Alley, who apparently has established a precedent for himself in tying up to a certain car so early before the race. Usually he is a last minute entry and starts without any preliminary practice on the track that to him is as familiar as the most erratic racing engine. Wilbur D'Alene and Ora M. Corum will handle the other pair of Monroes.

Although the Albert Guyot-Rolland Pillian entries have not materialized to date, there has been substituted one foreign entry, the Bently, to be entered and driven by W. Douglas Hawkes of the British Isles. The name Bently may not be familiar to many Motor Age readers, but it is almost a household word in England, where the Bently works are famous as the builders of rotary and radial pursuit airplane engines.

An additional pair of cars has been entered, one of which is called the Bentz Special, to be driven by William A. Gardner, and a car entered under the name of Mystery Car, the driver of which has not yet been named. As far as specifications go, both the Bentz and Mystery cars at this writing are in the mystery class.

E. G. "Cannonball" Baker is considered a real contender, based on the fact that he has a fast mount and undeniable physical stamina which he has often demonstrated on his many cross country trips.

It has been unofficially announced that the maximum number of cars to start will be restricted to 35 and the list as compiled May 5 shows that 32 of this number are already affixed to the Speedway roster. The list arranged as to order of entry is shown here.

The coming weeks will be filled with the usual pre-race practice and changes to the cars, particularly in regard to gear ratios. Motor Age will keep its readers informed of the activities of the various camps weekly.

As this is written, there has been received the report of the 50 and 100 mile races held at Cotati, Cal., Sunday, May 7, Jimmy Murphy, driving his Miller motored Murphy Special, which he will drive at Indianapolis, relieved Eddie Hearne of the guardianship of the 100-mile speedway record by covering the century in the remarkable time of 52:1.23, the equivalent of 114.93 m.p.h. The 50-mile race was awarded to Pietro Bordino, who covered the distance in 26:13.3, an average speed of 114.2 m.p.h. Bordino is the driver of the all roller-bearing Fiat, which showed enough velocity to outdistance Hartz, who finished second, and Murphy, who finished third. It is not known whether the Fiat will be seen at Indianapolis.

Entries Up to May 5 for Indianapolis 500 Mile Race

Car	*Driver*	*Entrant*
Disteel Duesenberg	*Eddie Hearne*	*Disteel Flyers, Inc.*
Frontenac	*Roscoe Sarles*	*Louis Chevrolet*
Frontenac	*E. G. "Cannonball" Baker*	*Louis Chevrolet*
Frontenac	*Peter DePaolo*	*Louis Chevrolet*
Frontenac	*Art Klein*	*Louis Chevrolet*
Frontenac	*Ralph Mulford*	*Louis Chevrolet*
Frontenac	*Unnamed*	*Louis Chevrolet*
Not Named	*Tommy Milton*	*Tommy Milton*
Leach Special	*Frank Elliott*	*Ira Vail*
Frontenac	*Unnamed*	*Mrs. Mae Harvey*
Duesenberg	*Harry Hartz*	*Harry Hartz*
Ballot	*Jules Goux*	*Jules Goux*
Ballot	*Not Named*	*Jules Goux*
Peugot	*Howard S. Wilcox*	*Howard S. Wilcox*
Duesenberg	*Wallace Reid*	*Wallace Reid*
Duesenberg	*Ralph De Palma*	*Ralph De Palma*
Fronty-Ford	*Jack Curtner*	*Jack Curtner*
Fronty-Ford	*C. Glenn Howard*	*Chevrolet Bros. Co.*
Duesenberg	*I. P. Fetterman*	*I. P. Fetterman*
Bently	*W. Douglas Hawkes*	*W. Douglas Hawkes*
Duesenberg	*Jules Ellingboe*	*Jules Ellingboe*
Duesenberg	*Jerry Wonderlich*	*Jerry Wonderlich*
Monroe	*Wilbur D'Alene*	*Monroe Motors Co.*
Monroe	*Tom Alley*	*Monroe Motors Co.*
Monroe	*Ora M. Corum*	*Monroe Motors Co.*
D'Wehr	*Frank Davidson*	*Frank Davidson*
Duesenberg	*Joe Thomas*	*Joe Thomas*
Duesenberg	*Unnamed*	*O A. Hoffman*
Bentz Special	*William H. Gardner*	*William A. Gardner*
Mystery Car	*No Name*	
Durant Special	*R. C. Durant*	*R. C. Durant*
No Name	*James Murphy*	*James Murphy*

MURPHY NOT IN GRAND PRIX

San Francisco, Cal., May 6—Jimmy Murphy has announced that he will not compete in the French Grand Prix again this year. It will be recalled that Murphy and his Duesenberg won this race last year. This year, the rules governing the race are so stringent as to virtually exclude all American cars, and the Grand Prix will not be run at all, unless at least 75 per cent of the entries are French cars.

ALLOWANCES ON USED CARS

Dallas, Tex., May 6—Cooperation of Dallas automobile dealers on a system for regulating of allowances on used cars in trades, is assured as a result of a meeting here in which a number of leading automobile merchants participated.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason	¾-1	$1650§	3¾x5	34x5†	34x5†	W
Acason	1½	1950	3¾x5¼	36x3½	36x6	W
Acason	2½	2750	4⅜x5¼	36x4*	36x8*	W
Acason	3½	3450	4⅜x5¼	36x5*	36x10*	W
Acason	5	4350	5 x6¼	36x6	40x12	W
Ace	1½	2295	3¾x5½	34x3½*	34x5*	W
Ace	2½	2795	4¼x5½	36x4*	36x7	W
Acme	20	1	....	3¾x5	35x5†	35x5†	W
Acme	30	1½	....	3¾x5	34x3½	34x5	W
Acme	40	1½	....	3¾x5	34x3½	34x5	W
Acme	60	3	....	4½x5¼	36x4	36x7	W
Acme	60L	3	....	4½x5½	36x4	36x7*	W
Acme	90	4½	....	4½x5½	36x5	40x10	W
Acme	125	6½	....	4¾x6	36x6	40x12	W
American	25	2½	3350	4 x6	36x4*	36x4d*	W
American	40	4	4275	4½x6	36x5*	36x5d*	W
Apex	G	1	1450††	3½x5	33x5†	33x5†	I
Apex	D	1½	1915	3¾x5½	34x3½	34x4	I
Apex	E	2½	2695	4¼x5½	36x4	36x7	I
Apex	F	3½	3975	4½x6	36x5	36x10	I
Armleder	20	1	2350	3¾x5¼	34x3½*	34x5*	W
Armleder	21	1½	2425	3¾x5¼	34x3½	34x6	W
Armleder	40	1½	2850	4½x5¼	34x3½	36x6	W
Armleder	HW	2½	3300	4¼x5½	36x4*	36x7*	W
Armleder	KW	3½	4150	4½x6	36x5	36x5d	W
Atco	B	1½	....	3¼x5¼	34x5†	36x6†	W
Atco	B1	1½	....	3¾x5¼	34x5†	36x6†	I
Atco	A	2½	....	4¼x5½	36x4†	36x8*	W
Atlas	MD	1	1185	3½x5	32x4½†	32x4½†	W
Atterbury	20R	1½	2475	3¼x5	34x3½	34x5	W
Atterbury	7CX	2½	3175	4½x5¼	36x4	36x4d	W
Atterbury	7D	3½	3975	4½x5½	36x5	40x5d	W
Atterbury	8E	5	4975	4¼x6	36x5	40x6d	W
Autocar	21UF	1½-2	1950	4¼x4½	34x4*	34x5*	D
Autocar	21UG	1½-2	2050	4¾x4½	34x4*	34x5*	D
Autocar	27H	2	2950	4 x5½	34x5	36x7	D
Autocar	27K2	2	3075	4 x5½	34x5	36x7*	D
Autocar	26Y	5	3950	4½x5½	34x5	36x12	D
Autocar	26-B	5	4100	4¼x5½	34x6	36x12	D
Available	H1½	1½	2175	4 x5½	36x3½*	36x5*	W
Available	H2	2	2775	4 x5½	36x3½*	36x6*	W
Available	H2½	2½	3160	4 x5½	36x4*	36x8*	W
Available	H3½	3½	4175	4½x5½	36x5	40x5d	W
Availabl	H5	5	5375	4¾x	36x6	40x12	W
Avery		1	....	3 x	34x5†	34x5†	I
Beck	A Jr.	1	1850	3½x5	32x4½	33x5	I
Beck	B-30	1½	2050	3¾x5	34x5	36x6	
Beck	C-40	2	2150	3¾x5	36x6	36x6	
Beck	D-50	2½	2850	4½x5¼	38x7	40x8	
Bell	(Pen.)	½	1300	3½x5	31x4§	31x4	B
Bell	M (Iowa)	1	1495	3⅝x5½	35x5	35x5†	W
Bell	E (Iowa)	1½	2100	3¾x5½	34x3½	34x5	I
Bell	O (Iowa)	2½	2550	4½x5½	34x4	34x6	I
Belmont	A	½	725	3¼x4¼	31x4	31x4	B
Belmont	D	2	2575	4¼x5½	34x3½*	34x6*	I
Belmont	F	3	3500	4 x6	36x5*	36x5d*	I
Bessemer	G	1	....	3½x5	35x5†	35x5†	I
Bessemer	H-2	1½	....	3¾x5	36x3½	36x5	I
Bessemer	J-2	2½	....	4½x5½	36x4	36x4d	I
Bessemer	K-2	4	....	4½x5½	36x5	36x10	I
Big 4	H	1½-4	5000	4½x6	36x6	36x6	W
Big 4	T	4	5500	4¾x6	36x6	36x6	W
Big 4	K	7	6000	5½x6	36x6	36x6	W
Big 4	HA	7	6000	4½x6	36x6	36x10	W
Brinton	C	1½	1500	3¾x5	34x4	34x5	W
Brinton	D	2½	2250	4⅝x5¼	36x4	36x7	W
Brockway	E	1	....	3¾x5⅛	35x5†	35x5†	B
Brockway	S-5	1½	....	3¾x5	36x3½*	36x5*	W
Brockway	SK	1½	....	4½x5¼	36x4	36x6	
Brockway	KR	2½	....	4½x5½	36x4	36x8	
Brockway	K-5	2½	....	4½x5¼	36x4	36x8	W
Brockway	RT	3½	....	4¾x6	36x5	36x10	
Brockway	R-4	3½	....	4½x5½	36x5	36x5d	W
Brockway	T-4	5	....	4¾x6	36x6	40x6d	W
Buick	Delivery	....	945††	3⅜x4¾	31x4†	31x4†	B
Capitol	G1½	1½	2975	3¼x5	35x5	38x7	W
Capitol	H2½	2½	3700	4¼x6	36x4	36x8	W
Capitol	K2½	2½	4250	4¼x6	36x6	42x9	W
Capitol	M3½	3½	4425	4¼x6	36x5	36x10	W
Case		2	....	4¼x5¾	36x6	38x7	I
Champion Light Commercial		½	1050††	3½x5	32x3½	32x3½	I
Chevrolet	G	¼	745	3½x4	31x4†	34x4½†	B
Chevrolet	T	1	1125	3½x5¼	33x4†	35x5†	W
Chicago	C1½	1½	....	3¾x5½	36x3½*	36x5*	W
Chicago	C2½	2½	....	4 x5½	36x4*	36x7*	W
Chicago	C3½	3½	....	4½x5½	36x5	36x10	W
Chicago	D5	5	....	4½x5½	36x6	40x12	W
Climber	A-20	1½	2050	3½x5	36x6*	38x7*	I
Clydesdale	10	¾-1¼	1485	3¾x5	34x5	34x5	B
Clydesdale	18	¾-1¼	1890	3¾x5	34x5	34x5	W
Clydesdale	20	1-1½	2385	3¾x5	34x5	34x5*	W
Clydesdale	42	1½-2	2175	3¾x5	36x3½	36x6	W
Clydesdale	65X	2½-3	3250	4½x5¼	36x4	36x8	W
Clydesdale	65EX	2½-3	3150	4½x5½	36x4	36x8	W
Clydesdale	90	3½-4½	4100	4½x5½	36x5	36x10	W
Clydesdale	120	5-6	4500	4¾x6	36x6	40x12	W
Columbia	H	1½	1895	4 x5	35x5	38x7†	I
Columbia	G	2½	2335	4 x5¼	36x4	36x7	I
Comet	T	1½	1950	3¾x5	34x4	34x4	W
Commerce	T	¾-1½	1450	3¾x5	34x4½†	34x4½†	B
Commerce	12	1½	1800	3¾x5	35x5†	35x5†	I
Commerce	16	2	2150	3¾x5	35x5†	36x6	I
Commerce	18	2½	2495	4¼x5¼	36x6†	36x7†	I
Commerce	25	2½	2425	4¼x5¼	36x4	36x7	W
Concord	A	2	$3150	4 x5½	36x3½	36x6	W
Concord	B	3	3600	4¼x5½	36x4	36x8	W
Concord	AX	2	3250	4 x5½	36x3½	36x6	W
Concord	BX	3	3600	4½x5½	36x4	36x8	W
Cook	51	2½	3600	4 x5½	36x6†	40x8†	W
Corbitt	E-22	1	1480	3¾x5	34x3½	34x4	W
Corbitt	D-22	1½	2200	3¾x5	34x3½	34x4	W
Corbitt	C-22	2	2600	4½x5¼	36x3½	36x6	W
Corbitt	B-22	2½	3000	4½x5½	36x4	36x7	W
Corbitt	R-22	3	3200	4½x5½	36x4	36x8	W
Corbitt	A-22	3½-4	3800	4½x5½	36x5	36x10	W
Corbitt	AA-22	5	4500	4¾x6	36x6	40x6d	W
Day-Elder	AS	1	1600	3¾x5	35x5†	35x5†	W
Day-Elder	B	1½	2000	3¾x5	34x3½	34x5	W
Day-Elder	D	2	2400	4¼x5¼	36x4	36x7	W
Day-Elder	C	2½	2750	4¼x5½	36x4	36x7	W
Day-Elder	F	3½	3150	4½x5½	36x5	36x5d	W
Day-Elder	E	5	4250	4½x6	36x5*	40x6d*	W
Dearborn	E	1	1600	3⅝x5½	35x5†	35x5†	W
Dearborn	FX	1½	2300	3⅝x5⅛	34x4	34x5	W
Dearborn	F	1½	2180	3¾x5⅛	34x4	34x5	W
Dearborn	48	2	2590	3¾x5⅛	34x4½†	34x7	W
Defiance	G	1	1695§	3¾x5	35x5†	35x5†	B
Defiance	D	1½	2095§	3¾x5	35x5†	36x6†	I
Defiance	E	2	2275§	3¾x5	35x5†	38x7†	I
DeMartini	1½	1½	2600	3¾x5	34x3½	34x6	W
DeMartini	2	2	3300	4 x5½	36x3½	36x7	W
DeMartini	3	3	4250	4¼x5½	36x4	36x10	W
DeMartini	4	4	4800	4½x6	36x5	36x12	W
Denby	31	1½	1485	3½x5	35x5†	35x5†	B
Denby	33	1½	2145	3¾x5	35x5†	38x7†	I
Denby	34	2	2395	3¾x5	36x3½	36x6	I
Denby	35	2½-3	2795	4½x5¼	36x4	36x7	I
Denby	27	4	3895	4½x5½	36x5	36x5d	I
Denby	210	5	4295	4½x5½	36x6	40x6d	I
Dependable	A	¾-1	1650	3⅝x5¼	34x5†	36x6†	W
Dependable	C	2	2350	3¾x5¼	34x3½	34x5	W
Dependable	D	2½	2650	4 x5½	34x5	36x6	W
Dependable	E	3	2950	4¼x5½	36x4	36x7	W
Diamond T	O-8	1-1¼	1975	3¾x5¼	36x3½	36x4†	W
Diamond T	FS	1½	2525	3¾x5¼	36x3½	36x5	W
Diamond T	T	1½	2250	3¾x5¼	36x3½	36x5	W
Diamond T	U	2-2½	2650	4 x5¼	36x4	36x7	W
Diamond T	K	3½	3750	4¼x5½	36x5	36x5d	W
Diamond T	EL	5	4325	4½x5½	36x6	40x6d	W
Diamond T	S	5	4500	4¾x6	36x6	40x6d	W
Diehl	A	1	....	3½x5	34x4½	35x5	I
Diehl	B	1½	....	3½x5	36x6	36x6	I
Dispatch	F	1	1350	3¾x5	34x4†	34x4†	I
Doane		2½	4100††	4¼x5¾	36x5	36x7	C
Doane		3½	5100††	4⅜x5¾	36x5	36x5d	C
Doane		6	6000††	5 x6¼	36x6	40x6d	C
Dodge Brothers		½	730	3⅞x4½	32x4†	32x4†	B
Dorris	K-4	2-2½	3400	4¼x5½	36x4	36x7	W
Dorris	K-7	3½	4400	4¼x5½	36x5	36x10	W
Dort	103	½	685	3½x5	31x4	31x4	B
Double Drive	B	3	4000	4¼x5½	6	6	W
Duplex	A	2	2775	4 x5¼	35x5†	38x7†	W
Duplex	E	3½	3500	4¼x5½	36x8	36x8	I
Duty	22	2	1590	3½x5	34x3½	34x5	I
Eagle	100-X	1½	....	3⅝x5½	34x5	34x5	I
Eagle	100-2	2	2275	3¾x5¼	34x4*	34x7*	I
Erie	E	1½	2185	3¾x5¼	36x6†	36x6†	W
Erie	A	2½	2985	4¼x5½	36x4	36x4d	W
F. W. D.	B	3	4200	4⅜x5½	36x6	36x6	B
Facto	1921	2½	2295†	4¼x5½	36x4*	36x8*	W
Fageol	1½	1½	3000	3¾x5¼	34x3½*	34x6*	W
Fageol	2½	2½	3900	4¼x5⅜	34x4	36x7	W
Fageol	3½	3½	5000	4½x6¼	36x5*	40x5d*	W
Fageol	5	5	5700	4½x6¼	36x6	40x6d	W
Fargo	R	2	1900	3¾x	36x4	36x6	I
Federal	SD	1½	1800	3¾x5	35x5†	36x6†	W
Federal	TE	1½	2175	4½x5¼	36x3½	36x5	W
Federal	UE	2-2½	2425	4½x5¼	36x4	36x7	W
Federal	WE	3½-4	3150	4½x5½	36x5	36x5d	W
Federal	X2	5-6	4500	4¾x6	36x6	40x6d	W
Ford	TT	1	430	3¾x4	30x3½†	32x4½†	W
Forschler	A	1	....	3½x5	31x3	34x4	W
Forschler	AX	1½	....	3½x5	36x3½	36x5	W
Forschler	B	2	....	4¼x5¼	36x4	36x7	W
Forschler	BX	3	....	4½x5¼	36x4	36x8	W
Front Drive	C	1½	2800	3⅝x5½	5	4	W
G & J**	20	1	2275	3⅝x5⅛	34x5†	34x5†	W
G & J**	A	2-2½	3375	4x5¼	36x4	36x7	W
G & J**	B	3½-4	4475	4½x5½	36x5	36x10	W
G.M.C.	K16	1	1295	3½x5½	34x5†	34x5†	B
G.M.C.	K-41A	2	2375	4 x5½	36x4*	36x7*	W
G.M.C.	K-41B	2	2375	4 x5½	36x4*	36x7*	W
G.M.C.	K-71A	3½	3600	4½x6	36x5	40x5d	W
G.M.C.	K-71B	3½	4050	4½x6	36x5	40x5d	W
G.M.C.	K-101A	5	3950	4½x6	36x5	40x6d	W
G.M.C.	K-101B	5	4450	4½x6	36x5	40x5d	W
G.W.W.		1½	1950	3¾x5½	35x5	35x5	I
Garford	15	¾	1590	3⅝x5⅛	34x5†	34x5†	W
Garford	25-B	1 1/4	1990	3¾x5⅛	36x6†	36x6†	W
Garford	70-H	2	2750	4¼x5½	36x4	36x7	W
Garford	77-D	3½	$3750	4½x6	36x5	36x6d	W
Garford	68D	5	4500	5 x6½	36x6	40x6d	W
Garford	150-A	7½	5200	5½x6	36x6	40x7d	C
Gary	F	1-1½	1675	3¾x5	36x3½	36x4	W
Gary	I	2	2150	4 x5½	36x3½	36x6	W
Gary	J	2½	2550	4½x5½	36x4	36x8	W
Gary	K—†	3½	3550	4½x6	36x5	40x5d	W
Gary	M	5	4000	5 x6½	36x6	40x6d	W
Gersix	M	1½	3100	4 x5½	36x3½	36x7	W
Gersix	K	2½	3500	4½x5½	36x4	36x8	W
Gersix		3½	4500	4½x6	36x5	40x12	W
Golden West	GH	3	4500	4½x6	36x7	36x7	W
Golden West	GJ	3½	5000	4½x5½	36x6	36x6	W
Graham Bros.	1-Ton	1	1265	3⅞x4½	33x4½†	34x5†	B
Graham Bros.	1½-Ton	1½	1325	3⅞x4½	33x4½†	36x6†	B
1Gramm-Pion.	10	1	1365	3½x5	33x5†	33x5†	F
1Gramm-Pion.	15	1½	1900§	3¾x5	36x3½*	36x5*	I
1Gramm-Pion.	15	1½	2500§	3¾x5½	36x3½*	36x5	W
1Gramm-Pion.	20	2	2025§	4½x5¼	36x4*	36x7*	W
1Gramm-Pion.	30	3	3275§	4¼x5½	36x4*	36x4d*	W
1Gramm-Pion.	75P	3½	4225§	4½x5½	36x6†	42x9†	W
1Gramm-Pion.	40	4	3995§	4½x5½	36x5	36x5d*	W
1Gramm-Pion.	50	5-6	4895§	4¾x6	36x6	40x6d*	W
Hahn	B2	1	1700§	3¾x5	34x5*	34x5*	W
Hahn	O	1½	1900	4½x5¼	36x3½*	36x6*	W
Hahn	K	2	2225	4½x5½	36x4*	36x8*	W
Hahn	L	3	2900	4½x5½	36x5*	36x10*	W
Hahn	M	5	3500	4⅝x6	36x6	40x12	W
Hahn	N	6	4500	4¾x6	36x6	40x12	W
Hal-Fur	E	1½	2350	4 x5½	34x5†	38x7†	W
Hal-Fur	B	2½	3000	4¼x5½	36x6†	36x8	W
Hal-Fur	F	3½	4000	4½x5½	36x6†	40x10	W
Hall	1½	1½	3100	3¾x5	34x5†	38x7†	W
Hall	2½	2½	3275	4½x5¼	36x4	36x6	W
Hall	3½	3½	4100	4½x5½	36x5	36x5d	W
Hall	5	5	5100	4½x5½	36x5	40x6d	W
Hall	7 chain	7	5100	4½x5½	36x5	40x6d	C
Harvey	WOA	2	2650	4¼x5½	34x4	34x7	W
Harvey	WFA	2½	2950	4¼x5½	36x4	36x7	W
Harvey	WHA	3½	3950	4½x6	36x5	36x5d	W
Hawkeye	K	1½	1850	3¾x5½	34x3½*	34x5*	I
Hawkeye	M	2	2650	4¼x5	36x4*	36x6*	I
Hawkeye	N	3½	3700	4½x6¾	36x5*	36x10*	I
Hendrickson	O	1½	2200	3⅝x5⅛	36x4†	36x5†	W
Hendrickson	N	2½	2690	4¼x5¾	36x4*	36x7*	W
Hendrickson	M	3½	3000	4¼x5	36x5*	36x5d*	W
Hendrickson	K	5	4000	5 x6¼	36x6	40x6	W
Huffman	B	1½	1995	3¾x5	34x3½	34x6	W
Huffman	C	1½	1795	3¾x5½	34x3½	34x6	I
Hurlburt	A	1½	2850	4 x5½	34x4	34x5	W
Hurlburt	B	2½	3750	4¼x5½	36x4	36x4d	W
Hurlburt	C	3½	4590	4½x6	36x5	36x5d	W
Hurlburt	D	5	5500	4½x6	36x5	40x6d	W
Indep'd't(Iowa)	B	1	1665	3½x5	34x3½	34x4	I
Indep'd't(Iowa)	G	1½	2040	3¾x5¼	34x3½	34x5	I
Indep'd't(Ia.)	H1	2½	2940	4¼x5¼	36x4	36x4	I
Indep'd't(Ohio)	F	1½	2385	3¾x5	36x3½	36x5	W
Indep'd't(Ohio)	H	2½	3085	4½x5¼	36x4	36x4d	W
Indep'd't(Ohio)	K	3½	3985	4½x5½	36x5	36x5d	W
Indiana	12	1½	....	3⅜x5¼	34x3½*	34x5*	W
Indiana	20	2	....	4½x5½	36x4*	36x7*	W
Indiana	25	2½	....	4½x5½	36x4*	36x8*	W
Indiana	35	3½	....	4½x5½	36x5*	36x5d*	W
Indiana	51	5	....	5 x6¼	36x5*	40x6d*	W
Inland	D	2	2950	4 x5	34x5	34x6	I
International	S	¾	1500	3½x5	34x5†	34x5†	I
International	21	1	1750	3½x5¼	36x3½	36x3½	I
International	31	1½	1850	3½x5¼	36x3½	36x4	I
International	41	2	2100	3½x5¼	36x3½	36x5	I
International	61	3	2400	4¼x5	36x4	36x6	I
International	101	5	3600	4¼x5	36x5	40x10	I
J & J	D	2	3250	4 x5	34x4*	34x6	I
Jackson	4WD	1½	3850	4½x5½	36x7	36x7	B
Jumbo	15	1½	2425	3¾x5¼	36x3½	36x5	I
Jumbo	20	2	2675	3¾x5¼	35x5†	38x7†	I
Jumbo	25	2½	3090	4½x5½	36x4	36x7	I
Jumbo	30	3	3590	4¼x5½	36x6†	42x9†	I
Jumbo	35	3½	4080	4½x6	36x5	36x10†	I
Jumbo	40	4	4730	4½x6	38x7†	44x10	I
K-Z	1	1	1750	3½x5	34x3½	34x5	W
K-Z	1½	1½	2075	3¾x5	36x4	36x6	W
K-Z	2½	2½	2550	4½x5¼	36x4	36x8	W
K-Z	3½	3½	3350	4½x5½	36x5	40x10	W
K-Z	5	5	3850	4½x5½	36x6	40x6d	W
Kalamazoo	G-1	1½	2495	3¾x5	34x4	34x5	W
Kalamazoo	G-2	1½	2800§	3¾x5	36x4	36x6	W
Kalamazoo	H	2½	3275§	4 x6	36x4	36x8	W
Kalamazoo	K	3½	4000§	4½x6	36x5	36x10	W
Kalamazoo	K-5	5	4500§	4½x6	36x6	36x6d	W
Karavan	A	2½	3750	4½x6	36x4	36x8	W
Kearns	H	1	1150	3½x5	32x4½†	32x4½†	I
Kearns	N	2	1650	3½x5	34x3½	34x6	I
2Kelly-S	K-31	1½	2700	3¾x5¼	36x3½	36x6	C
2Kelly-S	K-34	1½	2700	3¾x5¼	36x3½	36x6	W
2Kelly-S	K-38	2½	2900	3¾x5¼	36x4	36x4d	W
2Kelly-S	K-35	2½	2900	3¾x5¼	36x4	36x4d	C
2Kelly-S	K-40	3½	3900	4½x6½	36x5	40x5d	I
2Kelly-S	K-41	3½	3900	4½x6½	36x5	36x10	W
2Kelly-S	K-42	3½	3900	4½x6½	36x5	40x5d	W
2Kelly-S	K-50	5	4400	4½x6½	36x6	40x6d	C
2Kelly-S	K-60	6	4500	4½x6½	36x6	40x7d	C
Keystone	40	2	2175	3¾x5⅛	34x5†	38x7†	I
Kimball	AB	2	3675	4 x6	36x4	36x7	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. "Tires—optional. †Pneumatic Tires. 'd—dual. All others solid. ††Price includes body. §—Price includes several items of equipment.

1—Gramm-Pioneer. 2—Kelly-Springfield.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Kimball.....AC	2½	$3975	4¼x6	36x4	36x8	W
Kimball.....AK	3	4500	4½x6	36x4	36x10	W
Kimball.....AE	4	5000	4¾x6	36x5	40x12	W
Kimball.....AF	5	5500	5 x6	36x6	40x7d	W
Kissel....Express	1	1535†	3¾x5½	34x5†	34x5†	W
Kissel.....Utility	1½	1975	3¾x5½	36x3½	36x5	W
Kissel...Freigntner	2½	2875	4¼x5½	36x4	36x7	W
Kissel.....H. D.	4	3675	4¼x5½	36x5	36x5d	W
Kleiber.....AA	1	2200	4¼x5¼	34x3½*	34x5*	W
Kleiber.....A	1½	3100	4½x5¼	36x3½*	36x6*	W
Kleiber.....BB	2	3600	4½x5½	36x4*	36x7*	W
Kleiber.....B	2½	3950	4½x5½	36x5*	36x8	W
Kleiber.....C	3½	4250	4½x5½	36x5	36x5d	W
Kleiber.....D	5	5300	5 x6½	36x6	40x12	W
Koehler.....D	1½	1995	3½x5	34x3½	34x5	W
Koehler.....M	2½	3175	4 x5⅛	36x4	36x7	W
Koehler.....MCS	2½	3275	4 x5⅛	36x4	36x7	W
Koehler.....F	3½	4150	4½x5½	36x5	36x10	W
Koehler,MT. Trac	5	3275	4 x5⅛	36x4	36x7	W
Krebs-Collier..23	¾	1260	3⅜x5	34x4½	34x4½	B
Krebs-Collier..24	1	1565	3⅜x5	34x5	34x5	W
Krebs-Collier..45	1½	2125	4½x5½	36x4	36x7	W
Krebs-Collier..75	2½	2375	4½x5½	36x4	36x8	W
Krebs-Collier.110	3½	2975	4½x5½	36x5	40x10	W
Lange.....B	2½	3350	4½x5¼	36x4*	36x7*	C
Larrabee.....X-2	1	1925	3¼x4½	34x5†	34x5†	B
Larrabee.....U	1½	2400	3¾x5	34x3½	34x5	W
Larrabee.....J	1½–2½	2400	3¾x5	34x3½*	34x5*	W
Larrabee.....K	2½	3100	4½x5½	36x4	36x7	W
Larrabee.....K-5	2½–3	3450	4½x5½	36x4	36x8	W
Larrabee.....L-4	3½	4000	4½x5½	36x5	36x5d	W
Larrabee.....W	5	4800	4¾x6	36x6	40x6d	W
Luedinghaus.....C	1	1690	3½x5	35x5†	35x5†	W
Luedinghaus...W	1½	2490	3¾x5¼	34x3½*	34x5*	W
Luedinghaus...K	2–2½	2790	4¼x5½	36x4*	36x7*	W
Maccar.....L	1½	2700	4½x5¼	36x4	36x6	W
Maccar.....H-A	2	3100	4½x5¼	36x4	36x4d	W
Maccar.....H-2	3	3400	4½x5½	36x4	36x5d	W
Maccar.....H-3	4	4200	4½x5½	36x5	36x6d	W
Maccar.....G	5–6	4950	4¾x6	36x5	40x6d	W
MacDonald.....A	7½	5750	11x6	10x7	40x14	I
Mack...AB D.R.	1½	3150	5 x5	36x4	36x3½d	D
Mack...AB Chain	1½	3900	4 x5	36x4	36x3½d	C
Mack...AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack...AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack...AB D.R.	2½	3850	4 x5	36x4	36x4d	D
Mack...AB Chain	2½	3400	4 x5	36x4	36x4d	C
Mack...AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack...AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack...AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack...AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac....AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac....AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac....AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac....AC	13	5750	5 x6	36x6	40x12	C
Mack Trac....AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf...AA**	2	3775	4 x5¼	36x4	36x7	W
Mapleleaf...BB**	3	4350	4¼x5½	36x4	36x4d	W
Mapleleaf...CC**	4	5100	4½x5½	36x5	36x5d	W
Mapleleaf..DD**	5	6200	4½x5½	36x6	40x6d	W
Master.....JW	1½	2290	4½x5½	34x3½	34x5	W
Master.....JD	1½	2590	4½x5½	34x3½	34x5	D
Master.....Z	2	2290	4½x5½	34x3½	34x5	W
Master.....W	2½	2890	4¼x5½	34x4	36x7	W
Master.....DD	2½	3190	4¼x5½	34x4	36x7	D
Master.....A	3½	3900	4½x6	36x5	40x5d	W
Master.....E	3½	4290	4½x6	36x5	40x5d	D
Master.....Y	4	4490	4½x6	36x5	40x6d	D
Master.....B	5	4990	4¾x6½	36x6	40x6d	W
Master.....F	5	5090	4¾x6½	36x6	40x6d	D
MasterTrac.,DDT	6	3390	4¼x5½	34x4	36x7	D
Maxwell.....1½	1½	932	3⅝x4½	32x3	32x4	W
Menominee...HT	1–1¼	2000	3¾x5	34x3½	36x5	W
Menominee.....H	1½	2475	4 x5	36x3½	36x5	W
Menominee.....D	2–2½	2875	4 x6	36x4	36x8	W
Menominee.....G	3½	3800	4½x6	36x5	36x10	W
Menominee...J-3	5	4850	4¾x6	36x6	40x12	W
Moline.....10	1½	1985	3½x5	34x5†	36x6†	J
[3]Moreland..R. R.	1	1595	4 x5	34x5†	34x5†	B
Moreland.....BX	1½	1980	4 x5	36x3½	36x6*	W
Moreland.....EX	2	2800	4½x5¼	36x4	36x7*	W
Moreland.....AX	3	3500	4½x5½	36x5	36x10*	W
Moreland.....RX	4½–5	4600	4¾x6	36x6	40x6	W
Napoleon.....7	¾	1350	3½x5	38x4	33x4†	I
Napoleon.....9	1	1535	3½x5	35x5*	35x5*	I
Napoleon.....11	1½	1860	3½x5	35x5*	36x6*	I
Nash.....2018	1–1½	1595	3¾x5¼	35x5	36x6	I
Nash.....3018	2–2½	2150	3¾x5½	36x6	40x8	I
Nash.....Quad.	2–2½	2750	4¼x5½	40x8	40x8	I
Nash..3018, LWB	2–2½	2200	3⅞x5¾	36x6	40x8	I
Nash..Quad. LWB	2–2½	2800	4¼x5½	40x8	40x8	I
Nash.....5018	2½	2250	3¾x5½	34x4	34x6	I
[4]Nelson.....F1½	1½	....	4½x5½	36x3½	36x5	W
[4]Nelson.....F2	2	....	4½x5½	30x4	36x7	W
[4]Nelson.....F3½	3½	....	4½x5½	36x5	36x5d	W
[4]Nelson.....FC5	5	....	4¾x6	36x6	40x6d	W
Netco.....DK	2	3100	4½x5¼	36x4*	36x7*	W
Netco.....HL	2½	3500	4½x5½	36x4*	36x8*	W
New York.....M	1½	....	4½x5¼	36x3½	36x5	W
New York.....N	2–2½	....	4½x5¼	36x4	36x4d	W
Niles.....E	2	3000	4½x5¼	36x4*	36x7*	W
Noble.....B30	1½	....	3¾x5¼	36x3½	36x5	W
Noble.....C40	2	....	4 x5½	36x4	36x7	W
Noble.....D50	2½	....	4¼x5½	36x4	36x8	W
Noble.....E70	3½	....	4½x6	36x5	36x10	W
Northway.....B-2	2	3400	4 x6	36x4	36x4d	W
Northway.....B-3	3½	4400	4 x6	36x5	40x5d	W
Northwestern..W	1½	2700	4⅛x5¼	34x4	36x6	W
Northwestern.WS	2½	$3500	4½x5½	36x4	36x8	W
Norwalk.....25E	1	1595	3½x5	34x3½	34x4	W
Norwalk.....35E	1½	1925	3½x5	34x3½	34x3½d	W
Norwalk,35E.Spec	1½	2285	3¾x5¼	34x3½	34x5	W
O. K.....K1	1½	2450	4 x5½	36x3½	36x5	W
O. K.....L1	2½	3250	4¼x5½	36x4	36x8	W
O. K.....M1	3½	4250	4½x6	36x5	36x5d	W
Ogden.....D	½	....	3⅜x5	36x3½	36x5	W
Ogden.....D	1½	....	3¾x5	36x3½	36x5	W
Ogden.....E	2½	....	4½x5¼	36x4	36x8	W
Old Hickory...W	1	1775	3¾x5	36x3½*	36x4*	W
Old Reliable...A	1½	2350	4 x5	34x4	36x6	W
Old Reliable...B	2½	3500	4¼x6	34x4	36x4d	W
Old Reliable...C	3½	4250	4¼x6	36x5	36x5d	W
Old Reliable...D	5	5250	4¾x6	36x6	40x6d	W
Old ReliableKLM	7	6000	4¾x6¼	36x6	40x7d	C
Oldsmobile Econ.	1	1095	3½x5¼	35x5†	35x5†	I
Olympic.....A	2½	3200	4¼x5½	36x4	36x8	W
Oshkosh.....A	2	3250	3½x5	36x6†	36x6†	4
Oshkosh.....AA	2	3400	3½x5	36x6†	36x6†	4
Oshkosh.....B	2½	3850	4 x6½	38x7†	38x7†	4
Oshkosh.....BB	2½	4000	4 x5½	38x7†	38x7†	4
Overland.....4	½	450	3⅜x4	30x3½	30x3½	B
Packard.....EC	1½–3	3100	4½x5½	36x4	36x7	W
Packard.....EX	1½–3	3100	4½x5½	36x6†	40x8†	W
Packard.....ED	2–4½	4100	4½x5½	36x5	36x5d	W
Packard.....EF	4–7½	4500	5 x5½	36x6	40x6d	W
Paige.....52-19	1½	1950	4 x5¼	34x3½	34x5	W
Paige.....54-20	2½	2420	4¼x5½	34x4	34x8	W
Paige.....51-15	3½	3145	4½x5½	36x5	36x5d	W
Parker.....C-22	1	1875	3¾x5¼	34x5†	34x5†	W
Parker.....G-22	2½	3200	4¼x6	34x4	36x4d	W
Parker.....J-20	3½	3950	4½x6	36x5	40x5d	W
Parker.....M-20	5	4850	5 x6	36x6	40x6d	W
Patriot.....Revere	1	1380	3¾x5	35x5†	35x5†	W
Patriot...Lincoln	2	2050	4 5¼	34x3½	34x5	W
Patriot .Washgt'n	3	2900	4½x5½	36x4	36x7	W
Piedmont....4-30	1	1200	3½x5	34x4†	34x4†	W
Pierce-Arrow....	2	3200	4 x5½	36x4	36x4d	W
Pierce-Arrow....	3½	4350	4½x6¾	36x5	36x5d	W
Pierce-Arrow....	5	4850	4½x6¾	36x5	40x6d	W
Pioneer.....59	1	1550	3¾x4¼	32x4½†	32x4½†	W
Pittsburgher.....	1½–2	3000	3⅝x5	36x4	36x6	
Pittsburgher.....	3	3800	4½x5¼	36x5*	36x8	W
Power.....F	2	3150	3¾x5¼	36x5	36x7	W
Power.....C	3½	4250	4¼x5½	36x5	40x10	W
Premocar...B-143	1½	2475	3½x5	36x6†	36x6†	W
Rainier.....R-21	¾	1990	3½x5	35x5†	35x5†	W
Rainier.....R-19	1	2150	3½x5	34x3½	31x4	W
Rainier.....R-16	1½	2490	3¾x5	34x3½	34x5	W
Rainier.....R-18	2	2890	4½x5¼	34x4	34x6	W
Rainier.....R-20	2½	3550	4½x5¼	34x4	34x7	W
Rainier.....R-15	3½	4400	4½x5½	36x5	36x5d	W
Rainier.....R-17	5	5100	4½x6	36x6	36x6d	W
Ranger..TK-22-2	1½	2450	3¾x5	36x6†	38x7†	W
Reo.....F	¾–1¼	1245	4¼x4½	31x4½†	34x4½†	B
Reliance.....10A	1½	2400	4 x5¼	36x3½	36x5	J
Reliance.....20B	2½	3100	4¼x5½	36x4	36x4d	J
Republic.....75	¾	1395‡‖	3½x5	32x4½†	32x4½†	J
Republic....10	1	1395	3¾x5	34x3	34x4	J
Republic..10 Exp	1	1695	3¾x5	35x5†	34x5†	J
Republic.....11X	1½	1795	3¾x5	34x3½	31x6	J
Republic.....19	2½	2195	4¼x5¼	36x4	36x7	J
Republic.....20	3½	3095	4½x5½	36x5	36x10	J
Rowe.....CW	1½	3000	3¾x5	36x6†	36x6†	W
Rowe....C.D.W.	2	3300	4 x5	34x4	36x3½d	W
Rowe....G.S.W.	3	4150	4 x6	34x5	36x5d	W
Rowe....G.P.W.	3	5250	3¼x5‡	38x7†	42x9†	W
Rowe.....HW	4	4500	4½x6	36x5	36x6d	W
Rowe.....F. W.	5	5500	4½x6	36x6	40x6d	W
Ruggles.....20	1	1195	3¾x5	34x5†	34x5†	B
Ruggles.....40	2	1795	4 x5	34x5†	34x7	D
Sandow.....G	1	2295	3¾x5	34x3½	34x5	W
Sandow.....CG	1½	2590	3¾x5	34x4	34x6	W
Sandow.....J	2½	3275	4½x5¼	36x4	36x7	W
Sandow.....M	3½	4295	4½x5½	36x5	36x5d	W
Sandow.....L	5	4975	4½x5½	36x6	40x6d	W
Sanford.....25	2½	....	4½x5¼	36x4	36x4d	W
Sanford.....35	3½	....	4½x5½	36x5	36x5d	W
Sanford.....50	5	....	4¾x6	36x5	40x6d	W
Schacht...2-Ton	2	3200	4¼x5½	36x4	36x7	W
Schacht...3-Ton	3	3800	4½x5½	36x5	36x5d	W
Schacht...4-Ton	4	4200	4½x6	36x5	40x5d	W
Schacht...5-Ton	5	4400	4½x6	36x5	40x6d	W
Schacht...7-Ton	7	5050	4½x6	36x6	40x7d	W
Schwartz.....A	1	1695	3½x5	33x4½†	33x4½†	B
Schwartz.....BW	1½	2600	3¾x5¼	34x3½*	34x7*	W
Schwartz. C.W.S.	2½	3200	4¼x5½	36x4	36x8	W
Schwartz.....DW	5	4900	4½x6	36x6	40x12	W
Selden.....30	1½	2250	3¾x5	34x3½	34x5	W
Selden.....31	1½–2½	3350	4½x5¼	34x5	38x7	W
Selden.....50	2½	3250	4½x5¼	36x4	36x7	W
Selden.....51	2½–3½	4350	4½x5½	36x6†	40x8†	W
Selden.....70	3½–5	3750	4½x5½	36x5	36x10	W
Selden.....90	5–7	4950	4¾x6	36x6	40x12	W
Seneca.....M	½	820	3½x4½	30x3½†	30x3½†	B
Service.....12	¾	....	3¼x4½	32x4½†	32x4½†	B
Service.....15	1¼	....	3¾x5	34x4½†	35x5†	B
Service.....21	1½	....	3½x5½	34x3½	34x5	W
Service.....32	2	....	4 x5½	36x3½	36x7	W
Service.....37	2	....	4¼x5½	35x5†	38x7†	W
Service.....52	3	....	4¼x5½	36x4	36x8	W
Service.....72	3½	....	4¼x5½	36x5	36x5d	W
Service.....77	4	....	4½x6	36x5	36x5d	W
Service.....102	6	....	4½x6	36x6	40x6d	W
Signal.....NF	1	$1950	3¾x5	34x5†	36x6†	W
Signal.....H	1½	2450	4½x5¼	34x4	36x6	W
Signal.....J	2½	2875	4½x5¼	34x4	36x8	W
Signal.....M	3½	3675	4½x5½	36x5	40x5d	W
Signal.....R	5	4400	4¾x6	36x6	40x6d	W
Southern.....10	1	2090	3¾x5	34x3½	34x4	W
Southern.....15	1½	2590	3¾x5½	36x6†	34x4	W
Southern.....20	2	2990	4¾x5¼	36x6†	40x8*	W
Standard.....1-K	1½	1600	3¾x5	34x3½*	34x5*	W
Standard.....76	2½–3	2400	4½x5¼	36x4*	36x7*	W
Standard.....66	3½–5	3150	4½x5½	36x5	36x10	W
Standard.....5-K	5-7	4400	4¾x6	36x6	40x12	W
Sterling.....1½	1½	2885	4 x5¾	36x3½*	36x5*	W
Sterling.....2	2	3085	4 x5¾	36x4*	36x6*	W
Sterling.....2½	2½	3290	4¾x5¾	36x4*	36x4d*	W
Sterling.....3½	3½	4325	4½x6¼	36x5*	40x5d*	W
Sterling.....5-W	5	4950	5 x6¼	36x6	40x6d	W
Sterling.....5-C	5	5500	5 x6¼	36x6	40x6d	C
Sterling.....7½	7½	6000	5 x6¼	36x6	40x7d	C
Stewart.....14	¾	1245	3⅝x5⅛	32x4½†	32x4½†	I
Stewart.....15	1	1445	3⅝x5⅛	35x5†	35x5†	I
Stewart.....9	1½	1790	3¾x5	34x3½	34x5	I
Stewart.....7	2	2190	4¼x5½	34x4	34x7	I
Stewart.....7-X	2½	2390	4¼x5½	34x4	34x7	I
Stewart.....10	3½	3190	4½x5½	36x5	36x5d	I
Stewart.....10-X	3½	3190	4½x6	36x5	36x5d	I
Stougoton.....C	¾	1240	3½x5	34x4½†	34x4½†	W
Stoughton.....A	1	1790	3¾x5¼	34x5	34x5	W
Stoughton.....B	1½	2150	3¾x5¼	36x3½	36x5	W
Stoughton.....D	2	2490	4 x5⅛	36x4	36x7	W
Stoughton.....F	3	3150	4¼x5½	36x5d	36x5d	W
Sullivan.....E	2	2800	4¼x5½	36x4*	36x7*	W
Sullivan.....H	3½	3750	4½x6	36x5	36x5d	W
Superior.....D	1	1650	3¾x5	34x4½†	34x4	I
Superior.....E	2	2600	4½x5¼	36x4	36x6	I
Super Truck...50	2½	3300	4 x6	36x4	36x8	W
Super Truck...70	3½	4300	4¼x6	36x5	40x5d	W
Super Truck..100	5	5300	4¾x6	36x5	40x12	W
Super Truck..150	7½	6300	5 x6	36x6	40x7d	W
Texan.....A38	¾	1095	3½x5	33x4	33x4	I
Texan.....TK39	1½	1550	3½x5	36x6	38x7	W
Thomart SpeedT'k	1¼	1795	4 x5¼	34x5	34x5	B
Tiffin.....GW	1½	2100	4¼x5½	36x3½	36x5	W
Tiffin.....MW	2½	2700	4½x5¼	36x4	36x3½d	W
Tiffin.....PW	3½	3600	4½x5½	36x5	40x5d	W
Tiffin.....F50	5	4300	4¾x6	36x6	40x6d	W
Tiffin.....F60	6	4500	4¾x6	36x6	40x12	W
Titan.....	2	2950	4x5½	34x4*	36x7	I
Titan.....	3½	3950	4¼x5½	36x5	40x10	I
Titan.....	5	4550	4½x6	36x5	40x6d	I
Titan.....6-Ton	6	5150	4½x6	36x5	40x12	I
Tower.....J	1½	2900	4¼x5¼	35x5	38x7	W
Tower.....H	2½	3200	4½x5¼	36x4	36x7	W
Tower.....G	3½	4100	4½x5½	36x5	36x5d	W
Traffic.....C	....	1595	3¾x5	34x3½*	34x5*	I
Traffic.....	3	1895	3¾x5	36x4	36x7	I
Transport.....15	1	1295	3¾x5	32x4½†	32x4½†	B
Transport.....25	1½	1495	3¾x5⅛	34x3½*	34x4*	I
Transport.....35	2	1885	3¾x5	36x3½*	36x6*	I
Transport.....55	3	2385	4½x5¼	36x4*	36x8*	I
Transport.....60	3½	2585	4¼x5½	36x4*	36x8*	I
Transport.....75	5	3485	4½x6	36x5*	36x12*	I
Traylor.....B	1½	2390	3¾x5½	34x3½	34x5	W
Traylor.....C	2–2½	2850	4 x5½	36x4	36x7	W
Traylor.....D	3–3½	2300	4¼x5½	36x4	36x8*	W
Traylor.....F	5–6	4700	4½x6	36x6	40x8d	W
Triangle.....AA	!	1285	3¼x5	34x4½†	34x4½†	I
Triangle.....A	1½–2	1985	3¾x5¼	34x3½*	34x6*	I
Triangle.....C	2–2½	2285	3¾x5¼	36x4*	36x6*	I
Triangle.....B	2½–3	2585	4 x5¾	36x4*	36x7*	I
Triumph.....G	1	1995	3⅝x5⅛	34x5†	34x5†	W
Triumph.....HC	1½	2550	3¾x5¼	36x3½	36x5	W
Triumph.....HB	2	2900	3¾x5¼	36x4	36x7	W
Twin City...B.W.	2	2750	4 x5½	36x6	40x8	I
Twin City...A.W.	3½	3950	4¼x6	36x5	40x5d	W
[5]Twin City.....B	3½	....	5½x6	36x6	36x6	I
[5]Twin City.....A	5	....	5½x6	36x7	36x7	I
Ultimate.....A	2	3150	4 x5½	36x3½	36x6	W
Ultimate.....AJ	2	3200	4¼x5½	36x3½	36x6	W
Ultimate.....AJL	2	3250	4¼x5½	36x3½	36x6	W
Ultimate.....B	3	3700	4¼x5½	36x4	36x4d	W
Ultimate.....BL	3	3800	4¼x5½	36x4	36x4d	W
Ultimate.....D	5	5500	5 x6½	36x6	40x12	W
Union.....FW	2½	3490	4 x6	36x5*	36x8*	D
Union.....HW	4	4650	4½x6	36x6	40x12	D
Union.....JW	6	5800	5 x6	36x6	40x14	D
United.....A	1½	2445	3¾x5¼	36x3½*	34x5*	W
United.....B	2½	3150	4¼x5½	36x4*	36x7*	W
United.....C	3½	3975	4¼x5½	36x5	36x5d	W
United.....V	5	4500	4½x6	36x6	40x6d	W
United States...U	1	1875	3⅝x5⅛	34x5†	34x5†	B
UnitedStates,NW	1½	2225	3¾x5	36x5	36x3½	W
United States...N	1½	1975	3¾x5	36x3½*	36x5*	I
United States...R	3	3075	4 x5¼	36x4	36x4d	W
United States...S	4	3875	4½x5½	36x5	36x5d	W
United States...T	6	4850	4¾x6½	36x6	40x6d	W
Velie.....46	1½	1585	3¾x5	36x3½	36x5	I
Veteran.....M**	1½	2699	3¾x5¼	35x5†	35x5†	W
Veteran.....P**	2	3699	4¼x5½	36x4	36x7	W
Veteran.....R**	3	4200	4¼x5½	36x4	36x7	W
Veteran.....S**	4	5395	4½x6	36x5	36x10	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. d—dual. All others solid. ††Price includes body. §—Price includes several items of equipment.

3—Moreland Road Runner. 4—Nelson Le Moon. 5—Twin City Four Wheel Drive.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Vim.....29	½	$1050	3½x4½	31x4†	31x4†	W
Vim.....30	½	1175	3½x4½	32x4½	32x4½	W
Vim.....31	1	1975	3¾x5⅛	35x5†	35x5†	W
Vim.....22	2	3150	3¾x5⅛	36x4	36x6	W
Vim.....23	3	3950	4¼x5½	30x5	36x5‡	W
Vulcan.....25	2½	4000	4¼x6	36x4	36x8	W
Vulcan.....25P	3	4500	4¼x6	36x6	40x8	W
Walker-JohnsonA	2	2500	3¾x5	34x5	38x7	W
Walker-JohnsonB	3	3500	4¼x5½	36x4	36x8	W
Walter.....S	5	4850	4½x6¼	36x6	40x6d	W
Ward-LaF.....2B	2½	2990	4¾x5¾	36x4	36x4d	W
Ward-LaF.....4A	3½	3990	4½x6¼	36x5	36x5d	W
Ward-LaF.....5A	5	4590	5 x6¼	36x6	40x6d	W
Watson.....B	1	1865	3¾x5¼	35x5†	35x5†	W
Watson.....N	3½	4250	4½x5½	30x5	36x10	W
Western....W1½	1½	2550	4½x5¼	36x3½*	36x5*	W
Western....L1½	1½	2550	3¾x5	30x3½*	36x5*	W
Western....W2½	2½	3250	4½x5¼	30x4	36x7	W
Western....L2½	2½	3250	4¼x6	36x4	36x7	W
Western....W3½	3½	4250	4½x6	36x5	40x5d	W
White.....15	¾	2400	3¼x5½	34x5†	34x5†	B
White.....20	2	3250	3¾x5½	30x4*	36x7	D
White.....40	3½	4200	3¾x5¾	36x5	40x5d	D
White.....45	5	$4500	4¼x5¾	36x6	40x6d	D
White Hick.....E	1	1225	3¾x5	31x5†	34x5†	W
White Hick.....H	1½	1375	3¾x5	36x3½	36x5	W
White Hick.....K	2½	1675	4½x5¼	36x4	36x5	W
Wichita.....K	1	1875	3¾x5¼	36x3½	36x4*	W
Wichita.....M	2	2400	3¾x5¼	36x3½*	36x6*	W
Wichita.....RX	3	3200	4¾x5¼	36x4*	36x8*	W
Wichita.....O	4	3500	4½x6¼	36x5*	36x5*	W
Wilcox.....AA	1	1900	3¾x5½	36x1*	36x1*	W
Wilcox.....BB	1½	2550	4¼x5	36x4	36x5	W
Wilcox.....D	2½	3090	4¼x5	36x1*	36x3½d*	W
Wilcox.....E	3½	3950	4½x6	36x5*	36x5d*	W
Wilcox.....F	5	4350	4¾x6½	36x5	40x6d	W
Wilson.....F	1½	2270	3¼x5	36x3½	36x5	W
Wilson.....EA	2½	2825	4½x5¼	36x4	36x7	W
Wilson.....G	3½	3935	4½x5½	36x5	36x5	W
Wilson.....H	5	$4520	4¾x6	36x6	40x6	W
Winther.....751	1	1795	3½x5	31x4½†	35x5	I
Winther.....430	1½	2850	3¾x5	32x4	32x4	I
Winther.....39	1½	....	3¾x5	34x3½	34x5	I
Winther.....51	2½	....	4 x6	36x4	36x4d	I
Winther.....70	3½	....	4¾x6	36x5	36x5d	I
Winther.....450	2½	....	4 x6	34x5	36x6	I
Winther.....109	5	....	4½x6	36x6	40x5d	I
Winther.....140	7	....	5 x6	36x6	40x7d	I
Wisconsin.....A	1	1750	3¾x5	34x5†	34x5†	W,B
Wisconsin.....B	1½	2100	3¾x5	35x5	36x6	W
Wisconsin.....C	2½	2700	4 x5¾	36x6†	36x7	W
Wisconsin.....D	3½	3000	4⅜x5⅜	36x6†	40x8	W
Wisconsin.....E	5	3500	4½x6¼	36x6	30x10	W
Wisconsin.....F	7	4000	5 x6¼	36x6	36x12	W
Witt-Will.....N	1½	2250	3¾x5	36x3½*	36x5*	W
Witt-Will.....P	2½	2750	4½x5¼	36x3½*	36x7*	W
Wolverine.....J	1	2125	3½x5	34x3	34x4	I
Wolverine.....J	1½	2375	3¾x5	34x3½	34x5	I
Wolverine.....J	2	2640	3¾x5	34x4	34x7	I
Wolverine.....J	2½	3425	4½x5½	36x5	36x10	I
Wolverine.....L	3½	4100	4½x5½	36x5	36x10	I

*2-cyl. †6-cyl. ‡3-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. d—dual. All others solid. ††Price includes body. §—Price includes several items of equipment.

Specifications of Current Farm Tractor Models

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
Allis-Chalm..B	6-12	$250	2	LeR.	4-3⅛x4½	Gas.	1
Allis-Chal.G.P	15-25	1350	4	Midw.	4-4⅛x5¼	Gas.	3
Allis-Chalm...	20-35	1885	4	Own	4-4¾x6½	GorK	3-4
Allis-Chalm...	20-35	2085	4	Own	4-4¾x6½	G,K	4
Allwork...2-G	14-28	1695	4	Own	4-4¾x6	GorK	3
Allwork.....C	14-28	1395	4	Own	4-5 x6	GorK	3
AndrewsKin.D	18-36	2500	4	Clim.	4-5 x6½	GorK	4
ARO...1921-22	3-6	385	4	Own	1-4½x5	Gas.	1
Aultman-T....	15-30	2200	4	Clim.	4-5 x6½	G,K	4
Aultman-T....	22-45	3420	4	Own	4-5½x8	G,K	6
Aultman-T....	30-60	4500	4	Own	4-7 x9	G,K,D	8-10
Autonet. B-3	12-21	1250	4	Herc.	4-4 x5½	Gas.	2-3
Avery,SR.Cul.	5-10	....	4	Own	4-3 x4	G,K	..
Avery..Cult-C	..	....	3	Own	6-3 x4	G,K	..
Avery.....B	5-10	....	4	Own	4 3 x4	G,K	2
Avery.....C	....	....	4	Own	6-3 x4	G,K	..
Avery.....	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery.....	12-20	....	4	Own	4-4½x6	G,K,D	3-4
§Avery.....	....	....	*	Own	4-4x5½	G,K,D	3
Avery.....	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery.....	14-28	....	4	Own	4-4½	G,K,D	3-4
Avery.....	18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery.....	25-50	....	4	Own	4-6½x7	G,K,D	5-6
Avery.....	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates Mule..H	15-25	....	4	Midw	4-4¼x5¼	Gas.	3
Bates Mule..F	18-25	....	*2	Midw	4-4⅛x5¼	Gas.	3
‡Bates MuleG	25-35	....	*2	Midw	4-4½x6	Gas.	..
Beeman,....G	2-4	240	4	Own	1-3½x4½	Gas.	..
Best.....	18-30	3100	*2	Own	4-4¾x6½	G,K,D	4
Best.....	60	5450	*2	Own	4-6½x8½	G,K,D	8-9
Boring...1921	.....	1850	3	Wauk	4-4⅜x5¾	GorK	2
Burn-Oil. 1922	15-30	1435	4	Own	2-6¾x7	Ker.	3-4
Capital.....	15-30	1000	2	Own	4-4⅛x6	Gas.	3
Case.....	10-18	700	4	Own	4-3⅛x5	GorK	2
Case.....	12-20	1050	4	Own	4½x5	G,K,D	3
Case.....	15-27	1320	4	Own	4-4½x6	GorK	3-4
Case.....	22-40	2550	4	Own	4-5½x6¾	GorK	4-5
Case....40-72	40-72	5200	4	Own	7 x8	G,K,D	8-10
Caterpillar T11	25	3975	*2	Own	4-4¾x6	Gas.	4
Caterpillar T16	40	6050	*2	Own	4-6½x7	Gas.	6
Centaur.....	5-2½	345	2	N Way	2-4½x4½	GorK	1
Chicago....40	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac.....F	9-16	595	*2	Own	4-3¼x4½	G,K,D	2
Cletrac.....W	12-20	1345	*2	Own	4-4 x5½	G,K,D	2-3
Dakota.....4	15-27	1500	3	Dom,	4-4¾x6	Gas.	3
Depue.....A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill.....D	20	2380	4	Cont.	4-4½x5½	Gas.	3
Dill.....R.W.	20	2980	4	Midw.	4-4½x6	Gas.	3
Do-It-All....A	3-6	595	..	Own	1-4½x5	Gas.	1
Eagle.....F	12-22	....	4	Own	2-7 x8	GorK	3-4
Eagle.....F	16-30	....	4	Own	2-8 x8	GorK	4-5
E-B.....AA	12-20	1095	4	Own	4-4¾x6	G,K,D	3
E-B.....Q	12-20	750	4	Own	4-4¾x6	G,K,D	3
E-B.....	16-32	1750	4	Own	4-5¼x7	G,K,D	4
Fageol.....D	9-18	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse..B	18-30	1885	4	Clim.	4-5 x6½	G,K	4
Farquhar....	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar.....	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar.....	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch..4 Drive	20-35	1850	4	Clim.	4-5 x6½	GorK	3-4
Fordson.....	-18	395	4	Own	4-4x5	G,K	2
Fox.....E	20-40	2390	4	Own	4-5½x7½	G or K	4
Franklin....G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-4
ranklin....C	18-30	3350	*2	Clim.	4-5 x6½	G or K	3-4
Franklin...G2	18-30	$4350	2	Clim.	4-5 x6½	G or K	3-4
Frick.....A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick.....C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Grain Belt...A	18-36	2150	4	Wauk.	4-4¾x6¾	G or K	4
Gray.....1920	18-36	2000	3	Wauk	4-4¾x6¾	Gas,	4
Gt. Western St	20-30	1950	4	Beav.	4-4¾x6	K	4
Hart-Parr..20	20	945	4	Own	2-5¼x6½	K,D.	2
Hart-Parr..30	30	1295	4	Own	2-6½x7	K,D.	3
‡Hart-Parr....	....	1695	4	Own	6½x7	K.D.	..
Heider.....D	9-16	870	4	Wauk	4-4¼x5¾	G,K	2
Heider.....C	12-20	995	4	Wauk	4-4½x6¾	G,K	3
Heider...Cult	5-10	800	4	LeR.	4-3½x4½	Gas.	1
Huber Light 4.	12-25	1185	4	Wauk	4-4½x5¾	G or K	3
Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas	3
Illinois, Super-Drive....C	15-30	....	4	Clim.	4-5 x6½	G,K	4
Imperial.... E	40-70	4500	4	Own	4-7½x9	G,K,D	10
Indiana.....F	5-10	665	2	LeR.	4-3½x4½	Gas.	1-2
International .	8-16	†670	4	Own	4-4¼x5	G,K,D	2
Internatl.Titan	10-20	†700	4	Own	2-6½x8	G,K,D	3
International..	15-30	1750	4	Own	4-5¼x8	G,K,D	4
J-T.....N	20-40	....	*2	Clim.	4-5x6½	G,K,D	3-4
Lauson.....5	12-25	1495	4	Midw.	4-4½x5¼	Gas.	3
Lauson.....20	15-25	1685	4	Beav.	4-4½x6	G or K	3-4
Lauson.....21	15-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Lauson Road .	15-30	2225	4	Beav.	4-4¾x6	K	....
Leader.....B	12-18	685	4	Own	2-6 x6½	G,K,D	2-3
Leader.....N	16-32	1725	4	Clim.	4-5 x6½	G,K	3-4
‡Leader...GU	18-35	2150	*2	Clim.	4-5 x6½	G,K	3-4
Linn.....H4J	40-	4500	*	Cont.	4-4½x5½	Gas	4
Linn.....W	60	5000	*	Wauk	4-5 x6¼	Gas	6
Little Giant,.B	16-22	2200	4	Own	4-4½x5	K	4
Little Giant..A	26-35	3300	4	Own	4-5½x6	K	6
Lombard.1922	85-150	8950	*2	Wisc.	6-5½x6¾	Gas.	16
Lombard.1922	50	5300	*2	Wisc.	4-4¾x6½	Gas.	6-10
Master Jr.....	5-10	585		LeR.	-2⅜x4	Gas.	1
MerryGar1922	2	210	2	Evin	1-2⅝x2½	Gas.	..
Minne...All-P	12-25	900	4	Own	4-4½x7	G or K	3
Minne. Gen.P	17-30	1675	4	Own	4-4¾x7	G or K	3-4
Minne. Med.Duty	22-44	3000	4	Own	4-6 x7	G or K	5-6
Minne. HeavyDuty	35-70	4150	4	Own	4-7¼x9	G or K	8-9
Mohawk .1922	8-16	650	2	Light	4-3¼x4½	K or G	1-2
Moline Univ D	9-18	....	2	Own	4-3½x5	Gas.	2-3
Moline Orch..	9-18	....	2	Own	4-3½x5	Gas.	2-3
Motor Macult.	1½	195	2	Own	1-2¾x3½	Gas.	..
NB.....1	3-6	425	4	Own	2-3¾x4	Gas.	1
Nichols-Shep. .....20-42.	20-42	2650	4	Own	8 x10	G or K	3-6
Nichols Shep. 25-50	25-50	3000	4	Own	9 x12	G or K	4-7
Nilson Senior..	20-40	1975	5	Wauk	4-5 x6¼	G,K	4
Oil Pull.....K	12-20	....	4	Own	2-6 x8	K,D	3
Oil Pull.....H	16-30	....	4	Own	2-7 x8½	K,D	4
Oil Pull ....G	20-40	....	4	Own	2-8 x10	K,D	5-6
Oil Pull.....E	30-60	....	4	Own	2-10x12	K,D	8-10
Oldsmar GarK	2½-5	225	4	Own	1-5½x5½	Gas.	1
Oshkosh.....M	6-12	650	2	Own	2-4 x6	G,K	1
Oshkosh....G	12-24	985	2	Own	2-6 x7	G,K	3
Peoria.....L	12-25	$1600	4	Clim.	4-5 x6½	G,K	3
Pioneer.....G	18-36	1750	4	Own	4-5½x6	G,K,D	4
Pioneer.....C	40-75	3550	4	Own	4-7 x8	Gas.	10
Plowman....A	15-30	1295	4	Buda	4-4½x6	G,K	3-4
Reliable.....	10-20	390	4	Own	2-6 x7	Ker.	2
Rex.....	12-25	1600	4	Wauk	4-4¼x5¾	G or K	3
Russell.....	12-24	1500	4	Own	4-4¼x5¾	G or K	2-3
Russell.....	15-30	2200	4	Own	4-5 x6½	G or K	3-4
Russell.....	20-35	3000	4	Own	4-5½x7	G or K	4-5
Russell.....	30-60	5000	4	Own	4-8 x10	G or K	8-10
Samson....M	....	445	4	Own	4-4 x5½	G,K	2
Sandusky,....J	10-20	1250	4	Own	4-4¼x5½	G,K,D	2
Sandusky...E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shelby.....D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Shelby.....C	9-18	....	4	Wauk	4-3¾x5¼	G or K	2
Steady Pull..	12-21	1185	4	Own	4-4 x5	Gas.	3
Stinson....4E	18-36	1835	4	Beav.	4-4¾x6	G,K	4
Tioga.....3	18-32	....	4	Wisc.	4-4½x6	Gas.	3-4
Topp-Stewart.	30-45	....	4	Wauk	4-4⅜x6¾	Gas.	3-4
Toro Cultivator	6	750	3	LeR	4-3⅛x4½	Gas.	2
ToroTractor'22	6-10	495	3	LeR	4-3⅛x4½	Gas.	2
Townsend....	10-20	800	2	Own	4-6½x7	Ker.	2-3
Townsend....	15-30	1350	2	Own	4-7 x8	Ker.	3-4
Townsend....	25-50	2500	2	Own	4-8½x10	Ker.	4-8
Traction Motor	40-50	....	4	....	8-3¼x5	Gas.	4-5
Traylor....TB	6-12	500	4	LeR.	4-3½x4½	Gas.	1-2
Trundaar...10	25-40	3750	*2	Wauk	4-5 x6¼	G or K	4
Twin City....	12-20	1200	4	Own	4-4¼x6	G,K	3
Twin City....	20-35	2950	4	Own	4-5½x6¾	G,K	5
Twin City....	40-65	4750	4	Own	4-7¾x9	G,K	8
Uncle Sam C20	12-20	1295	4	Weid.	4-4 x5½	G	2-3
Uncle Sam B19	20-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21	20-30	1895	4	Beav.	4-4¾x6	G or K	3-4
Utilitor....501	2½-4	295	4	Own	1-3½x4½	G	1
Vim.....B	15-30	1190	4	Wauk	4-4¾x5¾	G,K	3
Wallis.....K	15-25	†995	4	Own	4-4¼x5¾	G,K	3
Waterloo...N	12-25	675	4	Own	2-6½x7	Ker.	3
Wetmore21-22	12-25	1185	4	Wauk	4-4 x5¾	G,K	3
Whitney....D	9-18	595	4	Own	2-5½x6½	Gas.	2
Wichita.....T	15-30	2500	4	Beav.	4-4½x6	G,K,D	3-4
Wisconsin...E	16-30	1850	4	Clim.	4-5 x6½	G or K	3
Wisconsin...F	20-40	2050	4	Wauk	4-5 x6¼	G or K	4
Wisconsin,..H	22-40	2550	4	Clim.	4-5½x7	G or K	4-6
Yuba....12-20	12-20	2400	*2	Wisc.	4-4½x6¾	G,K,D	3
Yuba....15-25	15-25	2750	*2	Wisc.	4-4¼x6	G,K,D	..
Yuba....20-35	20-35	3900	*2	Wisc.	4-5¾x7	G,K,D	4
Yuba....25-40	25-40	4250	*2	Wisc.	4-5¾x7	G,K,D	..
‡Yuba.....	25-40	4750	*2	Yuba	4-5½x7	D	..
Zelle.....	12-25	....	4	Buda	4-4¼x5½	G or K	3

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beav.—Beaver. Clim.—Climax. Cont.—Continental. Dom.—Domas. Evin.—Evinrude. Herc.—Hercules. LeR.—LeRoy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. T.C.—Twin City. Wauk.—Waukesha. Weid.—Weidely. Wis.—Wisconsin. *—Crawler type. All others are wheel type. †Price includes plows. §Track Runner. ‡Industrial Tractor.